SOKOLOV, A.A.; KOLESNIKOVA, M.M.

Behavior of fermion spin in the case of elastic scattering. Zhur. eksp. i teor. fiz. 38 no.1:165-171 Jan '60. (MIRA 14:9)

1. Moskovskiy gosudarstvennyy universitet.
(Quantum statistics) (Scattering (Physics))

SOKOLOV, A.A.; KOLESNIKOVA, M.M.

Scattering of [illegible] polarized [illegible]. Zhur. eksp. i teor. fiz. 38 no.6:1778-1785 Je '60. (MIRA 13:7)

1. Moskovskiy gosudarstvennyy universitet.
(Particles (Nuclear physics)—Scattering)

83169
S/056/60/039/002/006/044
B006/B056

21.2200

AUTHORS Samoylov, I. M., Sokolov, A. A.

TITLE The Problem of the Azimuthal Instability of Circulating Currents

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960
Vol. 39, No. 2 (8), pp. 257-259

4

TEXT: An investigation of the azimuthal effects of the space charge in synchrotrons[19] showed that, under certain conditions, these effects may exert considerable influence on particle motion. As A. A. Kolomenskiy and A. N. Lebedev (Ref. 2) have shown, an influence of these effects may be found also in other systems in consequence of the instability of the azimuthal homogeneous beam distribution. The results published here were obtained in investigations of electron capture in a betatron-type device (the parameters of which are given). Already in 1955, L. N. Bondarenko and A. A. Naumov had discovered that in measurements carried out with probes a high-frequency pulse occurs on the latter at the instant of injection

Card 1/3

The Problem of the Azimuthal Instability of Circulating Currents

S/056/60/039/002/006/044
B006/B056

The rules of this pulse excitation remained unexplained. The authors of the present paper obtained the following results: 1) In the case of injected square pulses of 50 cps, $\sim 10^{-5}$ sec duration, and U = 10 - 50 kv, a maximum intensity and stability of the high-frequency signal was observed at values of r_i which corresponded to about the maximum of the circulating current ($a/r_o \approx 0.1$) ($r_i = r_o + a$, r_o - injection radius). 2) The high-frequency oscillations were observed in the entire voltage range of 10 - 50 kv, and in the injection-current range J = 5 - 500 ma. At U = 20 kv, high-frequency oscillations occurred at J > 2 - 5 ma. 3) The oscillation frequency was found to be independent of J, the chamber pressure P(5.10^{-4} - 3.10^{-6} torr), and the position of the probes. 4) The amplitudes of the high-frequency signal are largest when the probe is near the beam. The maximum values of the amplitudes were 100 v. 5) The periods of the high-frequency oscillations are determined by $T = \varkappa T_o/m$, where m = 2,3,4,.. $T_o = 2\pi r_i/v$; at $\varkappa \approx 1.1$, r_o = 20 cm and a > 0; at r_o = 40 cm and a < 0, $\varkappa \approx 0.85$ (see diagram on p. 258). The deviation of $\varkappa$ from unity is connected with deviations of the mean energies of the particles forming clusters from the injection energy. All experimental

Card 2/3

4

The Problem of the Azimuthal Instability of Circulating Currents

results indicate that circulating currents are unstable and break up into clusters that are arranged uniformly with respect to the azimuth. Within these clusters there exist conditions that are responsible for the occurrence of peculiar radial-phase oscillations. The consequence of this is, e.g., that in collisions with the injector or the chamber walls, the electrons are captured in betatron-type devices. D. P. Ivanov, A. P. Komar, and Yu. S. Korobochko are mentioned. There are 1 figure and 6 references: 5 Soviet and 1 US.

SUBMITTED: March 5, 1960

Card 3/3

24.4500

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S/020/60/131/01/020/060
B013/B007

AUTHOR: Sokolov, A. A.

TITLE: The Clock Paradox in the Motion of Charged Particles in a Magnetic Field

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 1, pp 75 - 77 (USSR)

ABSTRACT: The author investigates the clock paradox in the relativistic motion of a charged particle in a betatron on the basis of the equation $m_0\ddot{x}_\mu = -\frac{e}{c}\dot{x}_\nu H_{\mu\nu}$. The points in this equation denote derivative with respect to the proper time s. This relativistically covariant equation describes the accelerated motion of a negatively charged particle (e.g. an electron) in an electromagnetic field. Here the four-dimensional coordinate is $x_\mu = \vec{r}, ict$. The magnetic field $\vec{H}$ and the electric field $\vec{E}$ are connected with the tensor $H_{\mu\nu}$ by the relations $H_z = H_{12}$; $iE_x = H_{41}$ etc. In the plane $z = 0$ the magnetic field is chosen in the form $H_x = H_y = 0$; $H_z(r,t) = F(t)\left[r^{-q} + \right.$

Card 1/4

The Clock Paradox in the Motion of Charged Particles in a Magnetic Field

$+ \pi \frac{1-q}{2-q} R^{2-q} \delta(x)\delta(y)\Big]$. For a stable motion it is necessary that the coefficient for the decrease of the magnetic field be within the limits $0 < q < 1$. If an electron at rest is in an equilibrium orbit in the initial instant of time, the electron will, in the course of time, move on an equilibrium orbit also in the case of an arbitrary increase of the magnetic field. Together with the magnetic field, an electric field must, in addition, exist, which will accelerate the revolution of the electron. For the electric field on the equilibrium orbit $E_z = 0$, $E_x = \frac{yR^{-q}}{c} F'(t)$, $E_y = -\frac{xR^{-q}}{c} F'(t)$ holds, where the primes mean derivatives with respect to time. With the substitution $x+iy = re^{i\varphi}$ (where φ denotes the polar angle) one obtains the following equations for the motion of the electron at the initial conditions $z = 0$, $\dot{\varphi} = 0$, $r = R$: $\dot{\varphi} = eH/m_o c$; $r = R = \text{const}$, $z = 0$; $\dot{t} = 1/\sqrt{1-\beta^2}$. Here β denotes the velocity of motion of

Card 2/4

The Clock Paradox in the Motion of Charged Particles in a Magnetic Field

S/020/60/131/01/020/060
B013/B007

the electron. After some calculations one finds $s - s_0 = \int_{t_0}^{t} \frac{dt}{\sqrt{(eRH/m_0c^2)^2 + 1}}$. With a constant magnetic field (F = const) the proper time s and the time of the observer are thus connected by the relation $s = \sqrt{1 - \beta^2}\,t$, which is well known from the theory of relativity. If the magnetic field increases according to the linear law $F = Bt$, $s = \frac{1}{\alpha} \ln(\alpha t + \sqrt{1 + \alpha^2 t^2})$ holds with $\alpha = \frac{eR^{1-q}}{m_0c^2} B_0$. By solution with respect to t: $t = \frac{1}{\alpha}$ shas is obtained. The equation just written down (which is also transformed) holds also for the motion of a particle with variable velocity in a magnetic field

Card 3/4

Card 4/4

21505
S/139/61/000/002/001/018
E032/E414

21.2000

AUTHORS: Sokolov, A.A. and Ternov, I.M.

TITLE: On the Theory of Synchrotron Radiation

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1961, No.2, pp.3-12

TEXT: This paper was presented at the 3rd Conference of Schools of Higher Education on Accelerators, in Tomsk, September 1959.

It is well known that at high energies (a few tens of Mev or higher) an electron moving in a cyclic accelerator becomes a source of strong synchrotron radiation, as predicted by Ivanenko and Pomeranchuk. This radiation has a number of special properties. The first of these is the characteristic intensity distribution: the intensity maximum is not found in the region of the fundamental (as in the nonrelativistic case) but in the region of higher harmonics whose order of magnitude is related to the electron energy E by the formula

$$\nu_{max} \sim (E/m_0c^2)^3 \qquad (1)$$

Card 1/5

The second property consists in that the emission is very directional since the photons are largely emitted in the direction of motion of the electrons. Moreover, the radiation is strongly polarized, i.e. the electric field vector has a preferred direction (parallel to the radius of the circular electron trajectory). Theoretical formulae describing the polarization (Ref.2: A.A.Sokolov and I.M.Ternov, ZhETF, 25, 698, 1953) were confirmed experimentally by F.A.Korolev et al (Ref.7). The third property of synchrotron radiation is its quantum character which becomes important as relatively low energies given by

$$E \sim E_{1/5} = m_o c^2 (m_o c\, R/h)^{1/5} \qquad (2)$$

where R is the radius of the instantaneous equilibrium orbit. The quantum character of the radiation leads to the fact that the radiation is emitted discretely and the number of photons emitted per revolution is given by

$$N \simeq \frac{1}{137} E/m_o c^2 \qquad (3)$$

On the Theory of Synchrotron ...

When $E > E_{1/5}$ (for example, at a few hundreds of Mev) the quantum character of the radiation should lead to the excitation of radial oscillations by quantum fluctuations. It was generally admitted at the Geneva Conferences on the Physics of Accelerators (1956 and 1959) that the quantum character of the radiation is of great practical importance. However, calculations based on the quasi-classical theory (Robinson, Kolomenskiy, Lebedev, Livingston and others) led to a large damping coefficient not only for classical oscillations but for quantum fluctuations also. In the present paper, rigorous quantum theory is used to investigate the motion of a radiating electron in two limiting cases, namely (a) free motion in the direction of the magnetic field (continuous spectrum) and (b) limited motion in the direction of the field (potential well with infinite walls; discrete spectrum). The second case is looked upon as an approximation to the real conditions of motion of an electron in an accelerator with magnetic focusing along the field. It is shown that in case (a) the time derivative of the momentum along the field is given by

On the Theory of Synchrotron ...

$$\frac{dk}{dt} = -k\frac{W}{E} \qquad (27)$$

where

$$W = \frac{2}{3}\frac{e^2c}{R^2}(E/m_0c^2)^4 \qquad (28)$$

Thus the electron experiences radiational friction which leads to damping, in complete agreement with classical theory (Ref.3: A.A.Sokolov and I.M.Ternov, DAN SSSR, 117,967,1957). In case (b) it is found that

$$\frac{d\kappa^2}{dt} = \frac{13}{24}\frac{1}{\sqrt{3}}\frac{e^2}{h}\frac{1}{R^2}(E/m_0c^2)^5, \qquad (38)$$

i.e. in distinction to the previous case, radiational damping is absent in the case of discrete spectra (quantized motion). The paper is concluded with a quasi-classical interpretation of the quantum effects. In the "real" case of an electron moving in a

Card 4/5

KURKIN, Yuriy Leonidovich, inzh.; SOKOLOV, Aleksandr Aleksandrovich, kand. tekhn. nauk, dotsent

Transistor amplifiers for impedance sign converters. Izv. vys. ucheb. zav.; elektromekh. 4 no.3:138-145 '61. (MIRA 14:7)

1. Kafedra poluprovodnikovykh priborov Moskovskogo energeticheskogo instituta.

(Transistor amplifiers)
(Impedance(Electricity))
(Electric networks)

SOKOLOV, Aleksandr Aleksandrovich, kand. tekhn. nauk; GUREVICH, B.M., inzh., nauchnyy red.; CHISLOV, M.M., red.; DORODNOVA, L.A., tekhn. red.

[Fundamentals of electronics]Osnovy elektroniki. Moskva, Prof-tekhizdat, 1962. 165 p. (MIRA 16:2)

(Electronics)

SOKOLOV, Arseniy Aleksandrovich, prof.; LOSKUTOV, Yuriy Mikhaylovich; TERNOV, Igor' Mikhaylovich; LARIN, S.I., red.; SMIRNOVA, M.I., tekhn. red.

[Quantum mechanics] Kvantovaia mekhanika. Pod obshchei red. A.A. Sokolova. Moskva, Gos. uchebno-pedagog. izd-vo M-va prosv. RSFSR, 1962. 591 p. (MIRA 15:3)

(Quantum theory)

SOKOLOV, Arseniy Aleksandrovich; GOL'DENBERG, G.S., red.; YERMAKOV, M.S., tekhn. red.

[Elementary particles]Elementarnye chastitsy; rasshirennaia publichnaia lektsiia prochitannaia v lektorii MGU 10 ianvaria 1962.g. Moskva, Izd-vo Mosk. univ., 1963. 67 p.
(MIRA 16:4)
(Particles (Nuclear physics))

SOKOLOV, A.A.; TERNOV, I.M.

Polarization and spin effects in the synchrotron radiation theory. Dokl. AN SSSR 153 no.5:1052-1054 D '63.
(MIRA 17:1)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova. Predstavleno akademikom N.N. Bogolyubovym.

L 4229-66 EWT(m)/EPA(w)-2/EWA(m)-2 IJP(c) GS

ACCESSION NR: AT5007964 S/0000/64/000/000/0921/0923

AUTHOR: Sokolov, A. A.; Ternov, I. M. 27 26 B+1

TITLE: Polarization and spin effects in the theory of synchrotron radiation 19

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 921-923

TOPIC TAGS: high energy accelerator, electric polarization, electron spin, synchrotron

ABSTRACT: Synchrotron radiation is strongly polarized, with 7/8 of the total radiation intensity being referable to the σ-component (the electric radiation field vector directed along the radius to trajector center) and 1/8 to the π-component (electric radiation field vector almost perpendicular to the orbit plane). (Sokolov, A. A.; Ternov, I. M., *ZhETF* 31, 473 (1956)). This conclusion was experimentally verified by experiments of F. A. Korolev and associates (DAN 110, 542 (1956)). In the present report the authors investigate the influence of electron spin orientation upon polarization and intensity of radiation if the electron moves in a constant and homogeneous magnetic field. In the investigation of spin ef-

Card 1/2

L 4229-66
ACCESSION NR: AT5007964

fects, the solutions of the Dirac equation are conveniently resolved into two states which characterize the spin orientation either (a) with or against the motion (longitudinal polarization) or (b) with or against the field (that is, almost perpendicular polarization, as in the authors' problem). The authors examine the solution of the Dirac equation which describes the motion of an electron in a magnetic field under certain physical conditions. Orig. art. has: 22 formulas.

ASSOCIATION: MGU imeni M. V. Lomonosova, SSSR

SUBMITTED: 26May64 ENCL: 00 SUB CODE: NP

NO REF SOV: 008 OTHER: 001

Card 2/2 GP

L 4237-66 EWT(m)/EPA(w)-2/EWA(m)-2 IJP(c) GS
ACCESSION NR: AT5007979 S/0000/64/000/000/1065/1072

AUTHOR: Abramyan, Ye. A.; Bender, I. Ye.; Bondarenko, L. N.; Budker, G. I.; Glagolev, G. B.; Kadymov, A. Kh.; Neshkov, I. N.; Naumov, A. A.; Pal'chikov, V. Ye.; Panasyuk, V. S.; Popov, S. G.; Protopopov, I. Ya.; Rodionov, Yu. I.; Samoylov, I. M.; Skrinskiy, A. N.; Yudin, L. I.; Kon'kov, N. G.; Mostovoy, Yu. A.; Nezhevenko, O. A.; Ostreyko, G. N.; Petrov, V. V.; Sokolov, A. A.; Timoshin, I. Ye.

TITLE: Work on the strong-current accelerators of the Nuclear Physics Institute, SO AN SSSR. (I) Strong-current pulse accelerators with spiral storage of the electrons. (II) Strong-current accelerators with one-revolution capture of the injected electrons

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 1065-1072

TOPIC TAGS: high energy accelerator, electron accelerator, electron beam, betatron, plasma

ABSTRACT: The work on developing strong-current electron ring accelerators was begun in 1965 by the authors at the Nuclear Physics Institute, Siberian Department, Academy of Sciences SSSR, with the object of studying the possibility of

Card 1/3

L 4237-66

ACCESSION NR: AT5007979

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forming relativistic stabilized beams. In the laboratories of the Institute experimental studies were carried out on the four methods for obtaining large ring currents of relativistic electrons: (1) spiral method of storing the electrons in installations of the betatron type with subsequent betatron synchrotron acceleration (Budker G. I. CERN Symposium 1, 68 (1956); (2) obtaining of limiting electron currents by means of the injection of electrons from a strong-current linear accelerator into a ring chamber of large aperture with subsequent synchrotron acceleration; (3) storage of electrons in tracks (parking orbits) with constant magnetic field by means of the multiple injection of electrons from another less strong-current accelerator; this method is utilized for the storage of electrons and positrons in experiments with colliding beams (expounded in detail by G. I. Budker in the present collection, p. 274); (4) obtaining of large electron currents by means of the acceleration of electrons by a ring plasma. The present report discusses the first two methods under the following topics: (I) pulsed iron-less betatron with preliminary charge storage (B-2 device); strong-current pulsed synchrotron B-2S; pulsed strong-current betatron with spiral storage (B-3 device). (II) iron-less one-turn strong-current synchrotron (BSB); strong-current pulsed synchrotron B-3M. Orig. art. has: 7 figures.

Card 2/3

L 4237-66
ACCESSION NR: AT5007979

ASSOCIATION: Institut yadernoy fiziki SO AN SSSR (Nuclear Physics Institute, SO AN SSSR)

SUBMITTED: 26May65 ENCL: 00 SUB CODE: NP,

NO REF SOV: 001 OTHER: 001

Card 3/3

ACCESSION NR: AP4041444 S/0188/64/000/003/0101/0103

AUTHOR: Sokolov, A. A.; Ternov, I. M.; Loskutov, Yu. M.

TITLE: The problem of radiation damping of betatronic oscillations

SOURCE: Moscow. Universitet. Vestnik. Seriya 3. Fizika, astronomiya, no. 3, 1964, 101-103

TOPIC TAGS: betatron, betatronic oscillation, cyclic accelerator, radiation damping, quantum theory, cyclic electron accelerator, electron accelerator, electron radiation, electron oscillation, electron motion, parabolization

ABSTRACT: After the demonstration of the influence of quantum fluctuations of radiation on the movement of electrons in a cyclic accelerator, the development of the quantum theory of electron movement acquired theoretical and practical significance. Recently, in a paper by S. A. Kheyfets and Yu. F. Orlov (ZhETF, 45, 1225, 1963), an attempt was made to obtain not only fluctuation activation of betatronic oscillations, but also classical damping using a nonrelativistic approximation in addition to the quantum method. These authors feel that one cannot obtain radiation damping in either the classical case or the quantum case because quadratic terms in r and $\frac{dr}{dt}$ are neglected in the equations of movement, i.e. "paraboliza-

Card 1/3

tion" of the potential energy describing the betatronic oscillations is carried out. The present authors then point out that "parabolization" of the potential energy actually takes place in both the classical and quantum calculations. Nevertheless, in spite of the assertions of S. A. Kheyfets and Yu. F. Orlov, with the help of the classical theory the authors at once found an expression for radiation damping:

$$\ddot{x} + \gamma\dot{x} + \omega_x^2 x = -\frac{q}{1-q}\frac{\overline{W}^{KR}}{E}\dot{x} \qquad (1)$$

They then review their previous work on the application of quantum theory to the excitation of betatronic oscillations, and show that the criticism of Kheyfets and Orlov concerning the origin of classical damping cannot be applied to the ultrarelativistic case of "free" betatronic oscillations. Attention is drawn, in this connection, to the work of Gutbrod (Zs. f. Phys., 168, 177, 1962). Taking into account all the terms of the analysis, one can obtain the following expression for the change in the quantum number s:

$$\frac{ds}{dt} = \frac{55}{48\sqrt{3}}\frac{e^2c}{R^2 m_0c^2 (1-q)^{3/2}}\left(\frac{E}{m_0c^2}\right)^6 - \frac{q}{1-q}s\frac{\overline{W}^{KR}}{E} \qquad (2)$$

where W^{kl} is the classical expression for the energy being radiated in a unit of

ACCESSION NR: AP4041444

time. In conclusion, the authors remark that the quantum fluctuations of the radius have great practical significance. In this regard, if the first quantum term in the right hand side of equation (2), corresponding to the quantum fluctuations, is neglected, then the square of the amplitude of the radial fluctuations rapidly vanishes in the presence of relatively large energies. Acutally, however, the amplitude of the vertical or axial oscillations tends toward a small positive limit. It also follows that the effect of classical damping begins to decrease at energies on the order of 400-600 Mev. The article is followed by a brief rebuttal by S. A. Kheyfets. Orig. art. has: 9 formulas.

ASSOCIATION: Kafedra teoreticheskoy fiziki Moskovskogo universiteta (Department of Theoretical Physics, Moscow University)

SUBMITTED: 07Dec63

SUB CODE: NP

NO REF SOV: 007

ENCL: 00

OTHER: 003

Card 3/3

ACCESSION NR: AP4029145 S/0105/64/000/004/0059/0066

AUTHOR: Ionkin, P. A. (Professor); Sokolov, A. A. (Docent)

TITLE: Topological analysis of electric networks

SOURCE: Elektrichestvo, no. 4, 1964, 59-66

TOPIC TAGS: topological analysis, electric circuit, electric network, electric network topological analysis, electronic component network

ABSTRACT: Classical methods of electric-network calculation, based on Kirchhoff's laws and loop currents and node voltages, are cumbersome and time-consuming. Matrix methods often involve long computations. The article sets forth the fundamentals of a better, topological method of network analysis as developed by S. J. Mason (Proc. IRE, 1953, v. 41, no. 9; 1956, v. 44, no. 7; 1957, v. 45, no. 6). These points are discussed: determinant expansion; topological methods of calculating the network determinant; topological law of

Card 1/2

ACCESSION NR: AP4029145

transmission for a passive network; same for a network with dependent sources. Orig. art. has: 12 figures and 27 formulas.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power-Engineering Institute)

SUBMITTED: 30May63 DATE ACQ: 01May64 ENCL: 00

SUB CODE: EC NO REF SOV: 009 OTHER: 012

Card 2/2

L 22476-65 EWT(m) DIAAP/AFWL/ASD(a)-5/SSD/AS(mp)-2/ESD(t)
ACCESSION NR: AP5002254 S/0139/64/000/006/0041/0050

AUTHOR: Sokolov, A. A.; Ternov, I. M.; Bagrov, V. G.

TITLE: Motion of relativistic electrons with oriented spin in a constant and homogeneous magnetic field

SOURCE: IVUZ. Fizika, no. 6, 1964, 41-50

TOPIC TAGS: synchrotron radiation, electron radiation, polarized electron, particle polarization, spin

ABSTRACT: After first reviewing earlier quantum-theoretical studies of the synchrotron radiation of an electron moving in a magnetic field, the authors present some results of an investigation of the distinguishing features of motion of electrons with oriented spin (polarized electrons) in a magnetic field. This problem is of interest in connection with numerous investigations of particle polarization properties. The spin properties of an electron in an external magnetic field are first described in relativistically-covariant form and the spin coefficients evaluated as functions of the spin-projection direction for both

Card 1/3

longitudinal polarization and polarization in the direction of the magnetic field. The behavior of the spin of a radiating electron moving in a magnetic field is then investigated and it is shown that the probability of quantum transitions with spin flip depends noticeably on the initial orientation of the spin. The change in the electron spin orientation occurs in such a way that the spin tends to orient itself in opposition to the magnetic field, and consequently synchrotron radiation causes initially unpolarized electrons to assume a predominant orientation opposite that of the field. The magnitude of the electron polarization is estimated statistically. For a field of 10^4 and an energy of 1 BeV, it is shown that the relaxation time is approximately 1 hour and that for a time much longer than that the polarization of an inititally unpolarized beam is 96%. Such a polarization can be attained in a storage ring. The influence of the vacuum on the spin orientation of an electron moving in a magnetic field is also estimated and it is shown that the vacuum magnetic moment has a favorable effect on the polarization of a radiating-electron beam. An analysis of the spin flip of electrons moving in a homogeneous and constant magnetic field and scattered by a Yukawa potential shows that the spin-flip lifetime is very large (approximately 10^9 sec for E = 500 MeV in 10^{-6} mm Hg vacuum), and consequently scattering is not

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001651930006-0"

L 22476-65
ACCESSION NR: AP5002254

capable of affecting the polarization of a radiating electron. Orig. art. has: 24 formulas.

ASSOCIATION: Uzhgorodskiy gosuniversiter (Uzhgorod State University)

SUBMITTED: 02Jul64 ENCL: 00 SUB CODE: NP

NR REF SOV: 014 OTHER: 005

Card 3/3

SOKOLOV, A.A.; TERNOV, I.M.; LOSKUTOV, Yu.M.

Radiation damping of betatron oscillations. Vest. Mosk. un. Ser. 3:Fiz., astron. 19 no.3:101-103 My-Je '64.
(MIRA 17:11)

1. Kafedra teoreticheskoy fiziki Moskovskogo universiteta.

ACCESSION NR: AP4040310 S/0057/64/034/006/1057/1072

AUTHOR: Samoylov, I.M.; Sokolov, A.A.

TITLE: Investigation of the process of accumulating large electron currents in accelerators

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.6, 1964, 1057-1072

TOPIC TAGS: electron accelerator, betatron injector, electron current accumulation

ABSTRACT: The method proposed by Budker and Naumov (G.I.Budker,AE,1,5,9,1956; G.I. Budker and A.A.Naumov,CERN Symposium,1956) for accumulating large numbers of circulating electrons for subsequent betatron acceleration was investigated experimentally with an apparatus that was constructed for the purpose and was not capable of betatron operation or of contracting the orbits. The radius of the chamber was 44 cm, and electrons could be injected at radii greater than 14 cm. The effective height of the chamber was limited to 10 cm by the brackets supporting the injector. The injector has been described elsewhere (I.M.Samoylov,PTE,No.1,24,1959); it was operated with rectangular pulses from 10 to 20 microsec duration, and the divergence of the beam was 2 to 3°. The variable magnetic field was produced by discharge of a

Card 1/3

capacitor through a winding about the central core, and its constant field was produced by a regulated (0.5%) current in another such winding. The pole pieces were shaped to produce a field with index n = -dlogH/dr between 0.4 and 0.5 throughout most of the chamber. The total circulating current and the currents at different radii were measured with a Rogovskiy loop, probes, and dummy targets introduced through openings in the side wall. Injection energies from 10 to 50 keV were employed, and a total circulating current of 20 A was achieved. With low injection currents and moderate pitch of the spiral orbits it was possible to capture 90 to 95% of the injected electrons. Under these conditions the fraction of electrons captured depended strongly on the injection direction, and good beam focusing was important. With large injection currents, when space charge effects were important, the fraction of the injected electrons accumulated decreased with increasing injection current, and the orbital current per turn approached a limiting value. The limiting orbital current per turn was found to be proportional to the three-halves power of the injection energy. The accumulated current was relatively insensitive to injection direction at high currents, and a beam divergence of 10^{o} could be tolerated. The size of the injector was also less important as a limiting factor at high currents. It is concluded that with a slightly larger machine and 150 keV injection, a total circulating current of 400 amp could be achieved, corresponding to the accu-

ACCESSION NR: AP4040310

mulation of 2 x 10^{13} electrons. The motion of the electrons is discussed theoretically in considerable detail. The loss of electrons under the conditions of the experiment was due largely to the development of vertcial oscillations. The specifically azimuthal space charge effect (negative mass effect) contributed to the efficiency of the initial capture of electrons from the injector, but it can lead to bunching and consequent loss of electrons by several mechanisms. "The authors express their deep gratitude to G.I.Budker and A.A.Naumov for their interest and advice, primarily as a result of which it was possible to complete this work." Orig. art. has: 33 formulas, 10 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 15Jul63 DATE ACQ: 19Jun64 ENCL: 00

SUB CODE: NP NR REF SOV: 013 OTHER: 004

Card 3/3

L 10666-66 EWT(1)/EWT(m)/T/EWA(m)-2 IJP(c)

ACC NR: AP5028315 SOURCE CODE: UR/0057/65/035/011/2012/2020

AUTHOR: Samoylov, I.M.; Sokolov, A.A.

ORG: none

TITLE: Influence of space charge on the longitudinal motion of particles in accelerators during injection

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 11, 1965, 2012-2020

TOPIC TAGS: particle accelerator, betatron, space charge, particle motion

ABSTRACT: The authors discuss the influence of longitudinal space-charge variations on the motion of charged particles in a weak-focusing cyclic machine in which stable bunches are formed or into which the particles have been injected during a time slightly shorter than that required for a full revolution, thus forming a single artificial bunch. It is shown that radial-phase oscillations develop as a result of the Coulomb interaction of the bunched particles, and equations describing these oscillations are derived. These oscillations limit the total charge that can be accumulated in the orbit, owing to the limited radial width of the channel. Injection experiments, using an internal injector, were performed with the BSB installation, described elsewhere (Raboty po sil'notochnym uskoritelyam IYaF SO AN SSSR, ch. 2. Trudy mezhdunarodnoy konferentsii po uskoritelyam (Dubna, 1963), str.1069, Atomizdat, M.,1964). The accumulated charge increased linearly with injection energy for

Card 1/2

UDC: 621.384.61

L 10666-66

ACC NR: AP5028315

injection energies from 20 to 80 keV. As a function of injection current, the captured charge reached a maximum at an injection current slightly above 0.1 A, whereas transverse space charge effects should not be significant for injection currents below about 1 A. It is concluded that the accumulated charge was limited by the longitudinal space charge effects discussed above. Quantitative agreement with the theory was not achieved; the measured accumulated charge was less than the calculated value by approximately a factor 2.5. Possible reasons for this discrepancy are coherent radiation and inaccurate evaluation of some of the parameters. After some discussion it is concluded that the discrepancy is not greater than can be reasonably accounted for. The maximum possible charge that can be accumulated, calculated with the present theory, increases rapidly with increasing injection energy, and it is concluded that the gamma yield of betatrons can be increased by more than three orders of magnitude by increasing the injection energy to 1.0-1.5 MeV. The effect of energy scattering in the injected beam is discussed in an appendix. Orig. art. has: 20 formulas, 4 figures, and 1 table.

SUC CODE: 20 SUBM DATE: 23Feb65/ ORIG. REF: 011 OTH REF: 006

Card 2/2

ACCESSION NR: AP4043835 S/0020/64/157/005/1096/1099

AUTHORS: Sokolov, A. A.; Ivanov, Yu. P.; Pavlenko, Yu. G.; Kerimov, B. K.

TITLE: Account of damping in weak interactions

SOURCE: AN SSSR. Doklady*, v. 157, no. 5, 1964, 1096-1099

TOPIC TAGS: weak interaction regime, elementary particle, scattering amplitude perturbation theory, polarization, neutrino, mu meson, electron

ABSTRACT: The scattering of an electronic neutrino by an electron or the scattering of a muonic neutrino by a muon are considered in the four-component theory with damping taken into account. The use of damping theory eliminates the difficulty arising at high neutrino energies (~10^3 BeV in the center of mass system), when the lower order of perturbation theory yields diverging series. Since the

Card 1/3

ACCESSION NR: AP4043835

solution of the equations of damping theory for the scattering amplitudes is equivalent to summation of a series of chain diagrams, this series can be summed in the region of convergence and the resultant scattering amplitude can be regarded as an analytic continuation of the series in the region of divergence. The summation is facilitated by using Wigner d-functions (M. Jacob and G. C. Wick, Ann. Phys., v. 7, 404, 1959) making the resultant amplitude differ from the perturbation-theory amplitude by the presence of a denominator such that the partial cross sections never exceed unity. In the case of antineutrino scattering by an electron, account must also be taken of the S and P waves. The polarization properties of scattering of neutrinos by polarized electrons is examined and it is shown that the recoil electrons will be fully polarized in a longitudinal direction only in the ultrarelativistic case. This report presented by N. N. Bogolyubov. Orig. art. has: 3 figures and 13 formulas.

Card 2/3

ACCESSION NR: AP4043835

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 24Mar64 ENCL: 00

SUB CODE: NP NR REF SOV: 001 OTHER: 007

Card 3/3

L 48125-65 EWT(m)/EWA(m)-2 Peb
ACCESSION NR: AP5011220 UR/0367/65/001/003/0507/0510

AUTHOR: Sokolov, A. A.; Ivanov, Yu. P.; Gal'tsov, D. V.

TITLE: Effect of spins on the annihilation and production of electron-positron pairs in weak interactions

SOURCE: Yadernaya fizika, v. 1, no. 3, 1965, 507-510

TOPIC TAGS: pair production, weak interaction regime, positron, electron spin, annihilation reaction

ABSTRACT: The effect of electron and positron spin orientations on their annihilation due to weak interaction is studied. The theory of the four component neutrino is used to study the reactions $e^- + e^+ \to \nu + \bar{\nu}$. The Hamiltonian for the $e^- + e^+ \to \nu + \bar{\nu}$ process in the case of the V-A interaction is given, and the total effective cross section is found for the case of solely longitudinal polarization of the pair e^-, e^+. From this it follows that for any energies either electron-neutrino or muon-neutrino pairs may form. It is found that the total effective cross section of e^- and e^+ annihilation with opposite helicity is twice as large as for particles with

Card 1/2

L 48125-65

ACCESSION NR: AP5011220

identical helicity. For $E \sim 1000$ Gev the cross sections for annihilation in the weak interaction description and in the electromagnetic are approximately the same.

$$\frac{\sigma}{\bar{\sigma}} \sim G^2 \frac{E^2}{m_0 r_0^3 c^6 \hbar^4} \quad \text{where} \quad r_0 = \frac{e^2}{m_0 c^2}.$$

Also studied is the polarization property of the electrons and positrons produced in the reaction: $\nu + \bar{\nu} \to e^- + e^+$. A cross section is derived. It can be shown that the case in question leads to parallel spins for the electrons, with antiparallel momenta. In the case considered, the spins of the neutrino and antineutrino will also be parallel.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: 10Jul64 ENCL: 00 SUB CODE: NP

NO REF SOV: 005 OTHER: 006

Card 2/2

SOKOLOV, A.A., KERIMOV, B.K.; SADYKHOV, F.S.; YAKHYAYEV, R.Sh.

Lepton annihilation of proton-antiproton pairs with allowance for form factors and polarization correlations. Dokl. AN SSSR 161 no.6: 1317-1319 Ap '65. (MIRA 18:5)

1. Moskovskiy gosudarstvennyy universitet i Fizicheskiy institut AN AzerSSR. Submitted November 13, 1964.

L 27863-66 EWA(k)/FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c)

ACC NR: AP6000747 WG/GG/AT SOURCE CODE: UR/0386/65/002/009/0449/0451

22
B

AUTHOR: Sokolov, A. A.; Pavlenko, Yu. G.

ORG: Physics Department, Moscow State University im. M. V. Lomonosov (Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta)

TITLE: Quantum theory of stimulated emission of electrons in crossed fields

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 9, 1965, 449-451

TOPIC TAGS: maser, laser, cyclotron maser, stimulated emission, electron emission, electrostatic field, quantum theory

ABSTRACT: The theory of an electron cyclotron maser is extended to include the presence of an electrostatic field. It is shown that stimulated emission of electric dipole radiation can be enhanced by an electrostatic field whose potential energy is of the type used in the analysis of a magnetron (P. L. Kapitsa, Uspekhi fizicheskikh nauk, v. 78, 1962, p. 181). The expression for the emitted power shows that stimulated emission reaches a maximum at the resonance. An applied electric field of this type should enhance stimulated emission at wavelengths of the order of tens of centimeters. Use of higher multipoles would decrease the wavelength at which emission could occur. Orig. art. has: 5 formulas. [CS]

SUB CODE: 20/ SUBM DATE: 16Sep65/ ORIG REF: 002/ OTH REF: 002/ ATD PRESS: 4162

Card 1/1

SOKOLOV, A.A.; IVANOV, Yu.P.; GAL'TSOV, D.V.

Influence of the spin effect on the annihilation and production of electron-positron pairs due to weak interaction. IAd. fiz. 1 no.3: 507-510 Mr '65. (MIRA 18:5)

1. Moskovskiy gosudarstvennyy universitet.

L 64311-65 EWT(m)/EWA(m)-2

ACCESSION NR: AP5012764 UR/0020/65/161/006/1317/1319

AUTHOR: Sokolov, A. A.; Kerimov, B. K.; Sadykhov, F. S.; Yakh'yayev, R. Sh.

TITLE: Lepton annihilation of proton-antiproton pairs with account of the form factors and of the polarization correlations

SOURCE: AN SSSR. Doklady, V. 161, no. 6, 1965, 1317-1319

TOPIC TAGS: particle interaction, correlation statistics, lepton, proton, electron, positron, muon, proton polarization

ABSTRACT: The authors investigate the annihilation process $\tilde{p} + p \to \tilde{l} + l$ ($l = e^-$ or μ^-, $l = e^+$ or μ^+0 with simultaneous account of the form factors of the proton and of the polarization correlation between all the particles participating in the process. The matrix element for the process is written out in the single-photon approximation and a formula is given for its differential cross section. The expression for the total cross section is obtained by differentiating over the angle and it is shown that the total cross section does not contain the proton-lepton pair polarization correlations. The results indicate that the energy dependence of the corss section of the annihilation process in question is very sensitive both to the form factors of the proton and to the polarization correlations of the produced lepton-antilepton pair. Inclusion of the form factors of the proton and of the

Card 1/2

L 61311-65

ACCESSION NR: AP5012764 9

spin states of the leptons reduces noticeably the total cross section as compared with the cross section for a pointlike proton; this is confirmed by the latest experimental data. This report was presented by N. N. Bogolyubov. Orig. art. has: 1 figure and 5 formulas. 49,55 49,55

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University); Fizicheskiy institut Akademii nauk AzerbSSR (Physics Institute, Academy of Sciences, AzerbSSR) 49,55

SUBMITTED: 03Nov64 ENCL: 00 SUB CODE: GP, NP

NR REF SOV: 002 OTHER: 005

KC

Card 2/2

ACC NR: AP6031257 SOURCE CODE: UR/0057/66/036/009/1536/1543

AUTHOR: Nelidov, A. B.; Samoylov, I. M.; Sokolov, A. A.

ORG: none

TITLE: Characteristics of the magnetic field of the BSB iron-free synchrotron 19

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 9, 1966, 1536-1543

TOPIC TAGS: electron accelerator, synchrotron, magnetic field

ABSTRACT: The magnetic field configuration of the BSB iron-free single turn synchrotron described elsewhere by G.I.Budker et al (ZhTF 36, 1523 (1966)/see Abstract AP6031256/) has been explored by exciting the magnet with sinusoidal current pulses having rise times of the order of 10^{-3} sec and measuring the field components at different locations with the aid of pickup coils and electronic integrators. The effect on the field configuration of introducing foreign objects (such as copper plates) into the working region was investigated. Some of the field measurements are presented graphically, and possible reasons for the observed field distortions are discussed. The index describing the radial dependence of the field strength was found to be close to the design value of 0.4 throughout a region whose axial extent is nearly half the height of the chamber, and the field distortions were found to be such as to shift the

Card 1/2

ACC NR: AP6031257

beam by some 3 to 5 mm. It is concluded that the internal equipment required for synchrotron operation (the accelerating resonator, measuring equipment, and the like) can be so designed as to produce no appreciable additional distortion of the field. The authors thank G.I.Budker and A.A.Naumov for their interest and advice. Orig. art. has: 6 figures.

SUB CODE: 20/ SUBM DATE: 27Sep65/ ORIG REF: 004/ OTH REF: 000

Card 2/2

L 11425-67 EWT(1)
ACC NR: AP6031258 SOURCE CODE: UR/0057/66/036/009/1544/1549

AUTHOR: Livshits, A.A.; Nelidov, A.B.; Samoylov, I.M.; Sokolov, A.A.

ORG: none

TITLE: Magnet power supply for the BSB iron-free synchrotron

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 9, 1966, 1544-1549

TOPIC TAGS: electron accelerator, synchrotron, magnet, power supply

ABSTRACT: The authors describe in some detail the power supply for the magnet of the BSB single turn iron-free electron synchrotron described elsewhere by G.I.Budker et al. (ZhTF 36, 1523 (1966)/see Abstract AP6031256/). The main power supply is a 5 kV 0.045 F capacitor bank coupled to the single turn synchrotron magnet with a pulse transformer that steps the current up by a factor of 10. The pulse transformer consists of a 40 turn primary and a 4 turn secondary of heavy copper strip on a 600 cm^2 cross section ring-shaped rectangular core of transformer steel sheets. Design features of the pulse transformer that enable it to withstand the electrodynamic forces incident to supplying a secondary current of up to 10^6 A are discussed. The pulse transformer operates with superposed magnetization, which is provided by discharge through the primary of an auxiliary capacitor bank prior to the discharge of the main

Card 1/2

L 11400-67 EWT(m) IJP(c)
ACC NR: AP6031259 SOURCE CODE: UR/0057/66/036/009/1550/1559

AUTHOR: Mostovoy, Yu. A.; Samoylov, I.M.; Sokolov, A. A.

ORG: None

TITLE: Single-revolution injection system of the BSB iron-free synchrotron

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 9, 1966, 1550-1559

TOPIC TAGS: electron accelerator, synchrotron, electron injection, spark gap, nanosecond pulse

ABSTRACT: The authors discuss the injection system employed in the BSB iron-free electron synchrotron described elsewhere by G.I.Budker et al. (ZhTF 36, 1523, 1966/ see Abstract AP6031256/). In this machine injection is accomplished during a single revolution of the electrons in the 41 cm radius orbit. Single-revolution injection was adopted because the efficiency of many-revolution injection is low in small machines in which the decrease per revolution of the radius of the instantaneous orbit is small. With single-revolution injection, on the other hand, it is in principle possible to capture practically 100% of the injected particles and to reduce the amplitude of the residual betatron oscillations to zero by proper design and positioning of the inflector. The conditions to be satisfied by the inflector for maximum capture efficiency are derived in an appendix; one such condition is that the traject-

Card 1/2

ory of the injected particles in the absence of the inflector be tangent to the equilibrium orbit at the center of the inflector. In the present machine the inflector is excited by up to 50 kV square pulses of 5 microsec duration applied through a pulse transformer. At the close of the 10 nanosec injection period the inflector is short circuited by the breakdown of two gaps, the breakdown being initiated by a trigger pulse applied to a third electrode in each gap. The design of these gaps, which should be useful for other applications, is discussed in detail in an appendix. The scatter in the breakdown time of these gaps ranged from 2 nanosec to less than 1 nanosec, depending on the height of the trigger pulse. Measurements on a 70 keV injected beam showed that at least 70 % of the injected electrons were captured in an equilibrium orbit and that the amplitude of the betatron oscillations of 50 % of the captured electrons was less than 2 cm. Analogous measurements at the operating injection energy of 600 keV could not be made because of noise from the injector. It is concluded that single-revolution injection is entirely feasible for accelerators in which the period of the equilibrium orbit is as short as 5 nanosec. The authors thank G.I. Budker and A.A.Naumov for their interest in the work, and P.I.Medvedev, V.N.Shchavelin, and M.Ya.Rogutskiy for their participation in the development of different parts of the inflector system.

SUB CODE: 20/ SUBM DATE: 27Sep65/ ORIG REF: 005/ OTH REF: 000

ACC NR: AP7003222 SOURCE CODE: UR/0056/66/051/006/1829/1832

AUTHOR: Sokolov, A. A.; Zhukovskiy, V. Ch.; Korovin, Yu. A.

ORG: Moscow State University (Moskovskiy gosudarstvennyy universitet)

TITLE: Stimulated transitions in the radiation from a relativistic electron in an inhomogeneous magnetic field

SOURCE: Zh eksper i teor fiz, v. 51, no. 6, 1966, 1829-1832

TOPIC TAGS: relativistic electron, electron radiation, stimulated emission, axial magnetic field, maser theory, ELECTRON TRANSITION

ABSTRACT: The authors consider stimulated transitions of relativistic electrons moving in a constant but inhomogeneous magnetic field. In particular, the radiation from an electron placed in an axially symmetrical focusing magnetic field is investigated. The probability of the stimulated emission is obtained for an external electromagnetic wave which is linearly polarized and which propagates at a certain angle to the magnetic field direction. From this probability, the authors determine the power radiated by the electron in the case of resonant transitions induced by the external electromagnetic field at various harmonics, and the power of the dipole radiation. The region of variation of the harmonics, at which the stimulated emission should prevail over absorption, and is thus of interest in maser applications, is determined. Two conditions for emission are formulated in the form of inequalities relating the different parameters of the problem. Orig. art. has: 16 formulas.

SUB CODE: 20/ SUBM DATE: 15Jun66/ ORIG REF: 001/ OTH REF: 001

Card 1/1

ACC NR: AP7004135 SOURCE CODE: UR/0051/67/022/001/0003/0008

AUTHOR: Sokolov, A. A.; Pavlenko, Yu. G.

ORG: none

TITLE: Stimulated and spontaneous emission in crossed fields

SOURCE: Optika i spektroskopiya, v. 22, no. 1, 1967, 3-8

TOPIC TAGS: stimulated emission, spontaneous emission, electron radiation, wave function, Schrodinger equation, quantum generator, maser radar

ABSTRACT: The stimulated emission and absorption produced by an electron moving in crossed electric and magnetic fields is analyzed by methods of quantum mechanics. The wave function of the electron in the crossed field is obtained by solving the Schrodinger equation in cylindrical coordinates. This yields the range of variation of the axial, orbital, radial, and principal quantum numbers. Selection rules are derived for the possible induced transitions and the intensity of the induced emission and absorption is calculated. The conditions under which emission prevails over absorption are determined. It is shown in particular that if an electric field of approximate intensity 10^4 v/cm is superimposed on the magnetic field ($\sim 10^3$ Oe) for which a maser has already been realized (J. L. Hirshfield and J. M. Wachtel, Phys. Rev. Lett. v. 12, 533, 1964), the intensity of this maser would be greatly increased at a

Card 1/2 UDC: 35.33:539.124

ACC NR: AP7004135

wavelength of the order of 10 cm. The analogy between the results and the theory of the radiating electron is discussed. The authors thank [illegible] theory for a number of important remarks, and V. Ch. Zhukovskiy and Yu. A. Korovin for help with the calculations. Orig. art. has: 30 formulas. (W.A. 14)

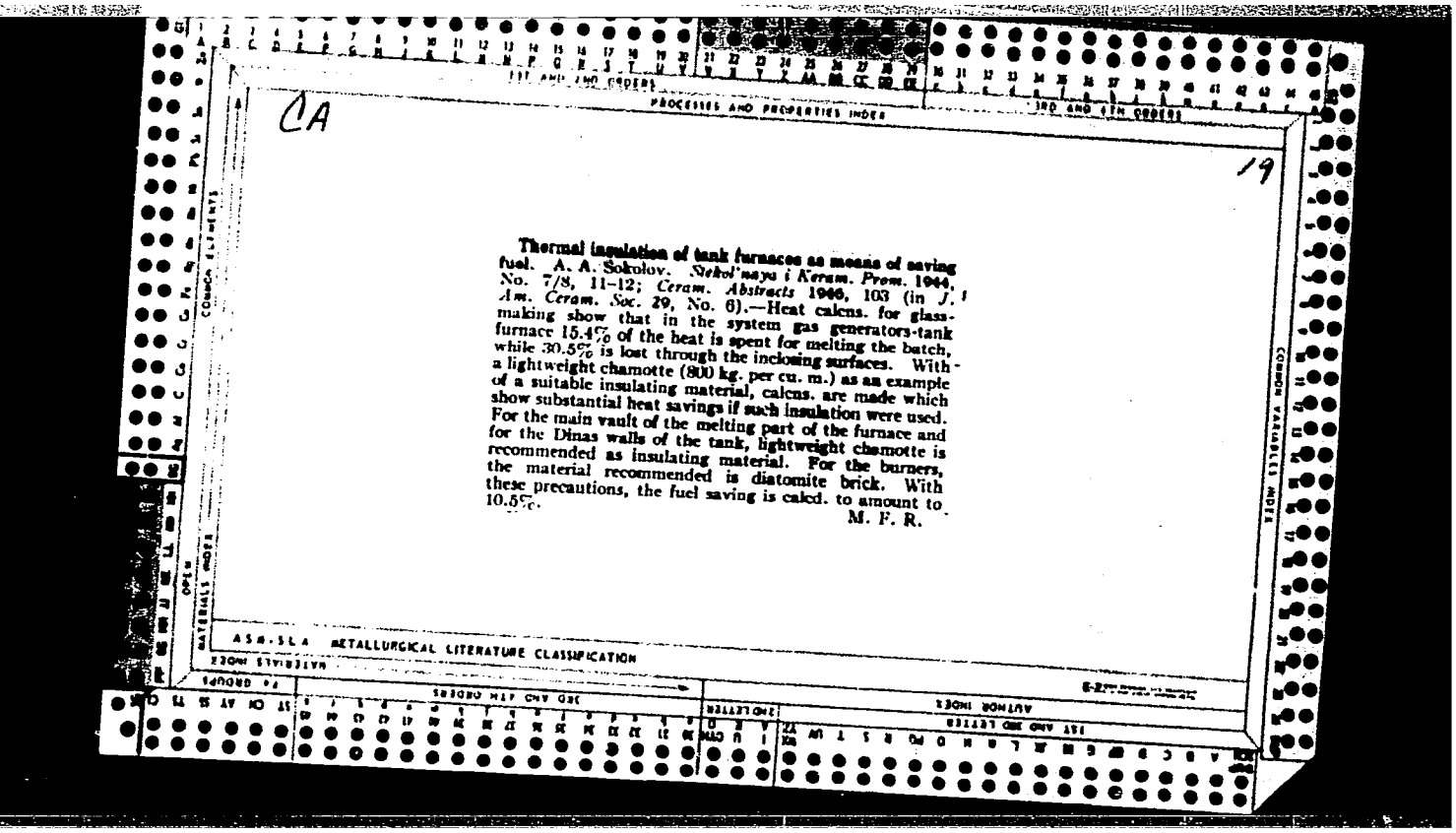
SUB CODE: 20/ SUBM DATE: 06Jul65/ ORIG REF: 006/ OTH REF: 002

Card 2/2

A. C.S.

Glass

Calculation of convection currents of glass in tank furnaces. A. A. SOKOLOV. *Stekol'naya i Keram. Prom.*, 1944, No. 4/5, pp. 3-7; No. 6, pp. 7-11.—An extensive mathematical analysis of the convection currents of molten glass in tank furnaces is presented. The currents are calculated from the temperature, density, and viscosity at various spots and at various levels in the tank. The method of calculation makes possible the computing of the current coefficient and the quantity of heat carried by these currents from the melting to the working end of the furnace. From these data, the heat balance of a tank furnace can be computed. M.Ho.



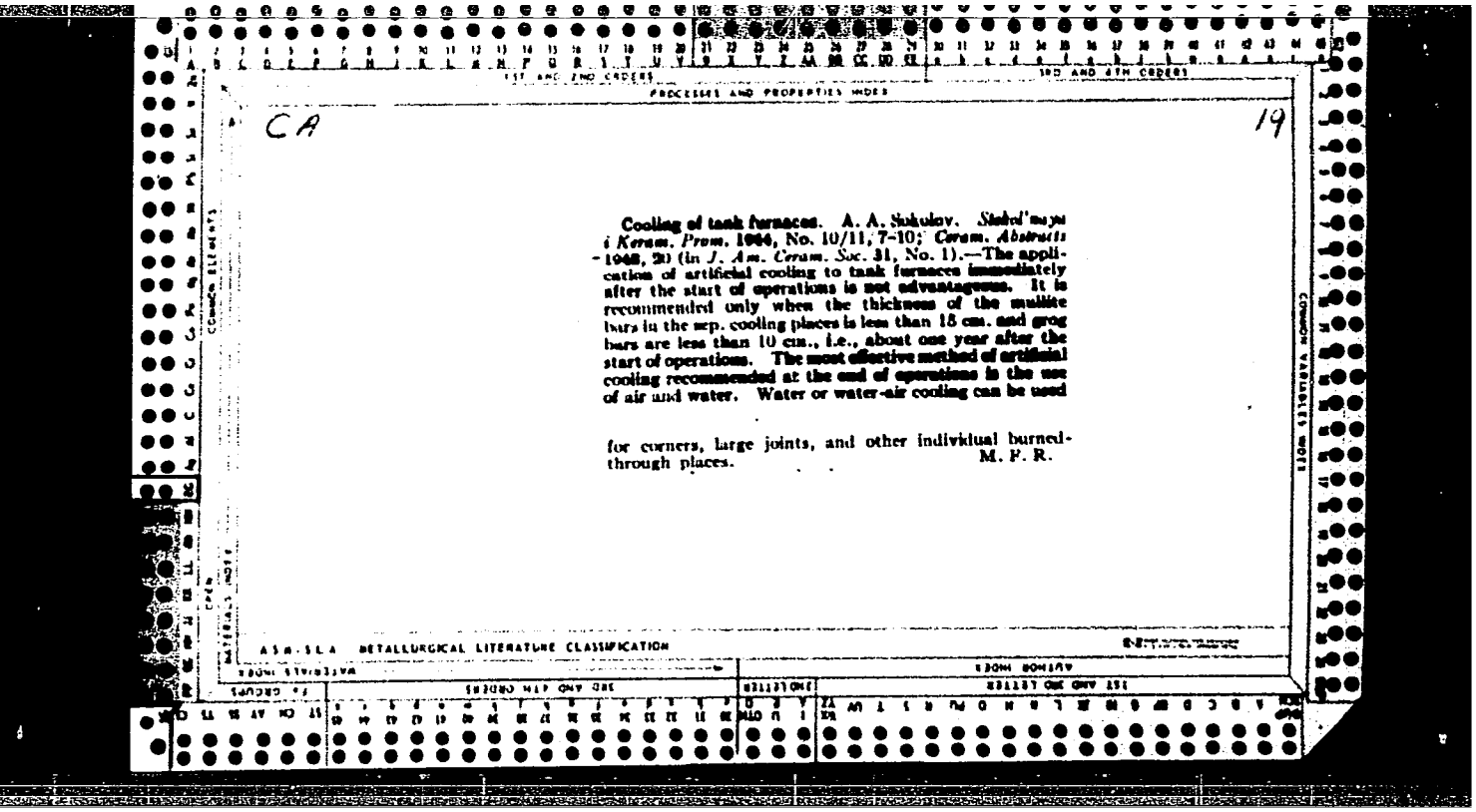
CA

19

Thermal insulation of tank furnaces as means of saving fuel. A. A. Sokolov. *Steklo'naya i Keram. Prom.* 1944, No. 7/8, 11–12; *Ceram. Abstracts* 1946, 103 (in *J. Am. Ceram. Soc.* 29, No. 6).—Heat calcns. for glass-making show that in the system gas generators-tank furnace 15.4% of the heat is spent for melting the batch, while 30.5% is lost through the inclosing surfaces. With a lightweight chamotte (800 kg. per cu. m.) as an example of a suitable insulating material, calcns. are made which show substantial heat savings if such insulation were used. For the main vault of the melting part of the furnace and for the Dinas walls of the tank, lightweight chamotte is recommended as insulating material. For the burners, the material recommended is diatomite brick. With these precautions, the fuel saving is calcd. to amount to 10.5%.

M. F. R.

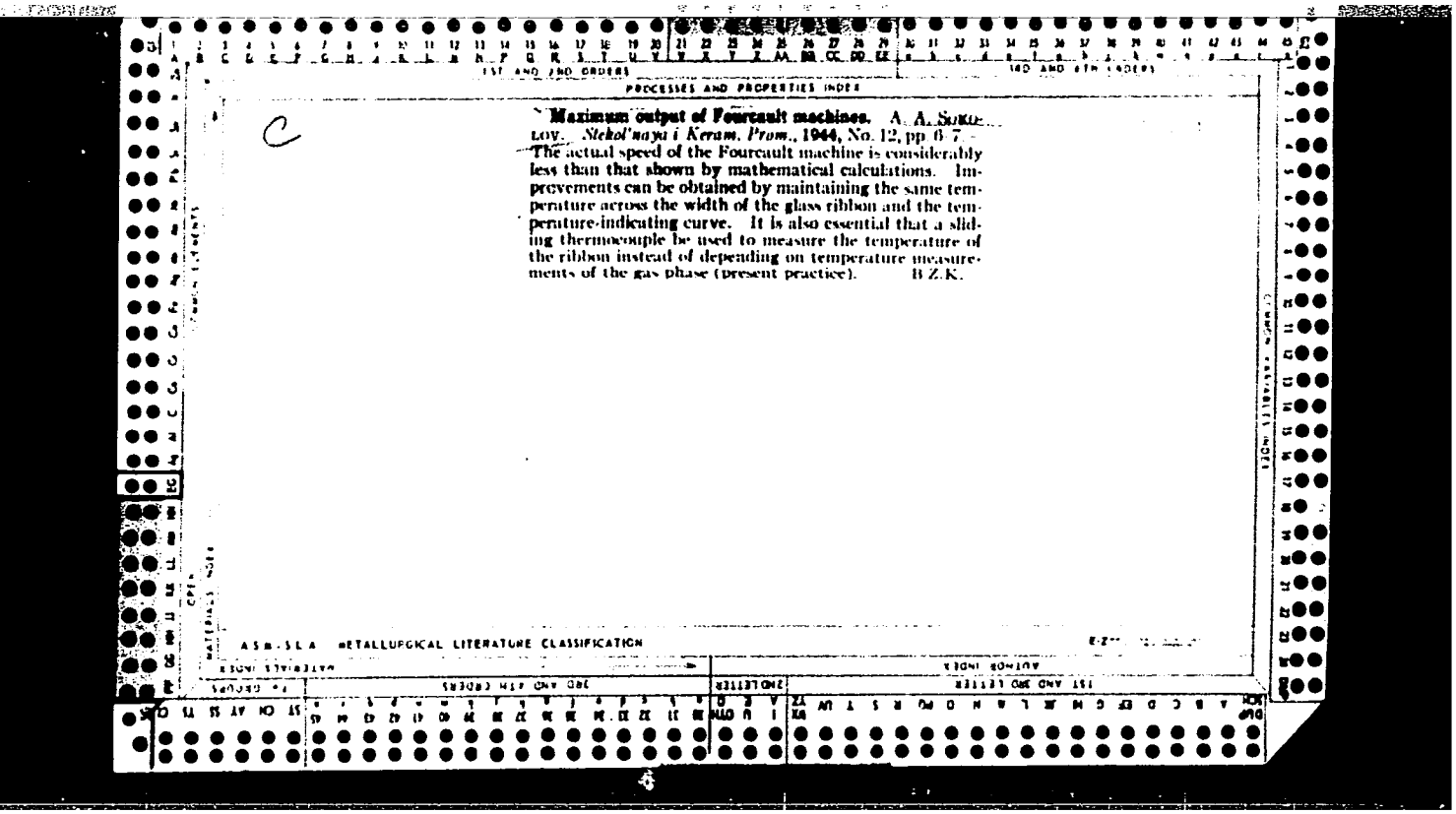
ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



CA 19

Cooling of tank furnaces. A. A. Sukulov. *Stekol'naya i Keram. Prom.* 1948, No. 10/11, 7-10; *Ceram. Abstracts* 1948, 20 (in *J. Am. Ceram. Soc.* 31, No. 1).—The application of artificial cooling to tank furnaces immediately after the start of operations is not advantageous. It is recommended only when the thickness of the mullite bars in the sep. cooling places is less than 18 cm. and grog bars are less than 10 cm., i.e., about one year after the start of operations. The most effective method of artificial cooling recommended at the end of operations is the use of air and water. Water or water-air cooling can be used for corners, large joints, and other individual burned-through places.

M. F. R.

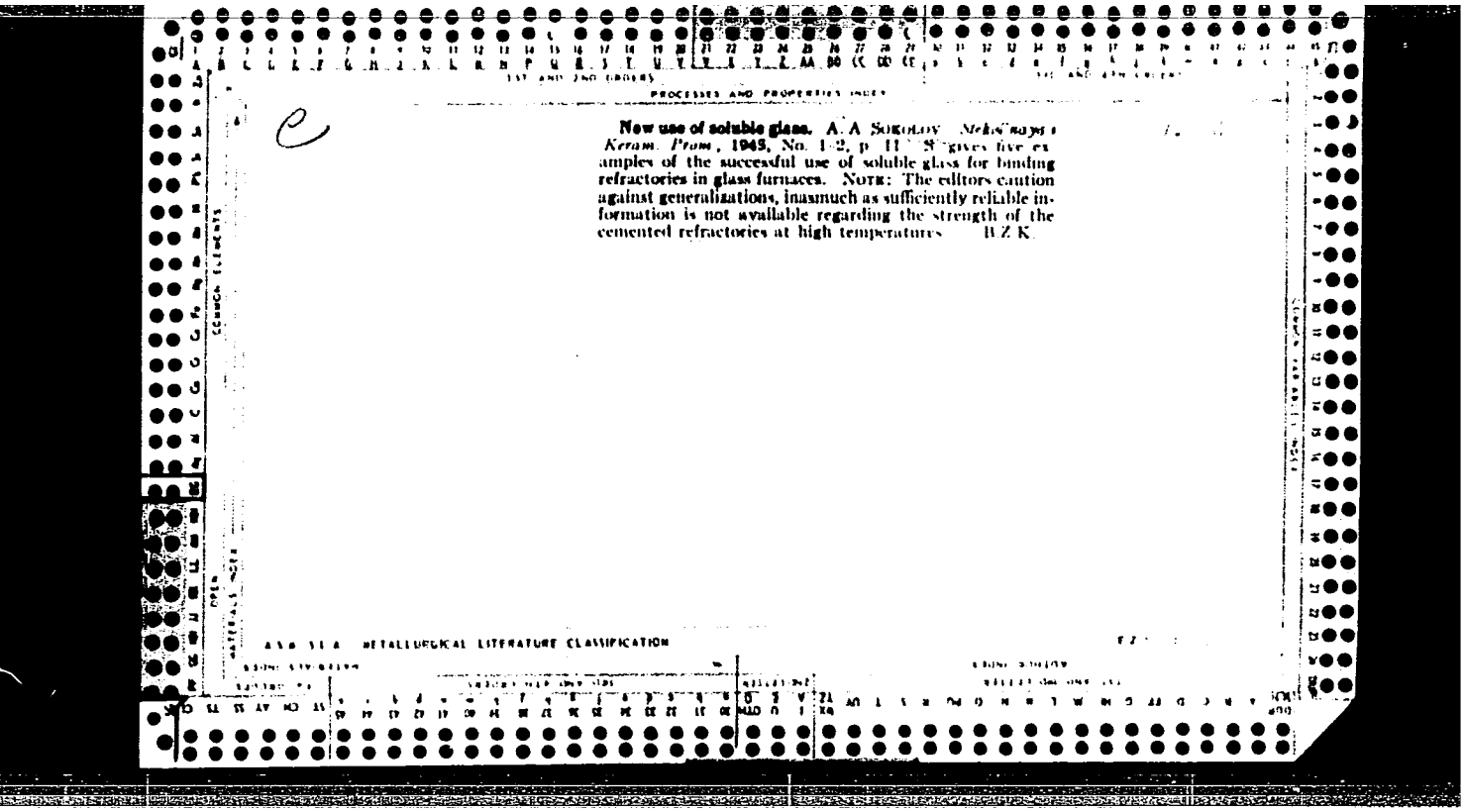


PROCESSES AND PROPERTIES INDEX

C

Maximum output of Fourcault machines. A. A. SOKOLOV. *Steklo'naya i Keram. Prom.*, 1944, No. 12, pp 6-7.—The actual speed of the Fourcault machine is considerably less than that shown by mathematical calculations. Improvements can be obtained by maintaining the same temperature across the width of the glass ribbon and the temperature-indicating curve. It is also essential that a sliding thermocouple be used to measure the temperature of the ribbon instead of depending on temperature measurements of the gas phase (present practice). B Z K

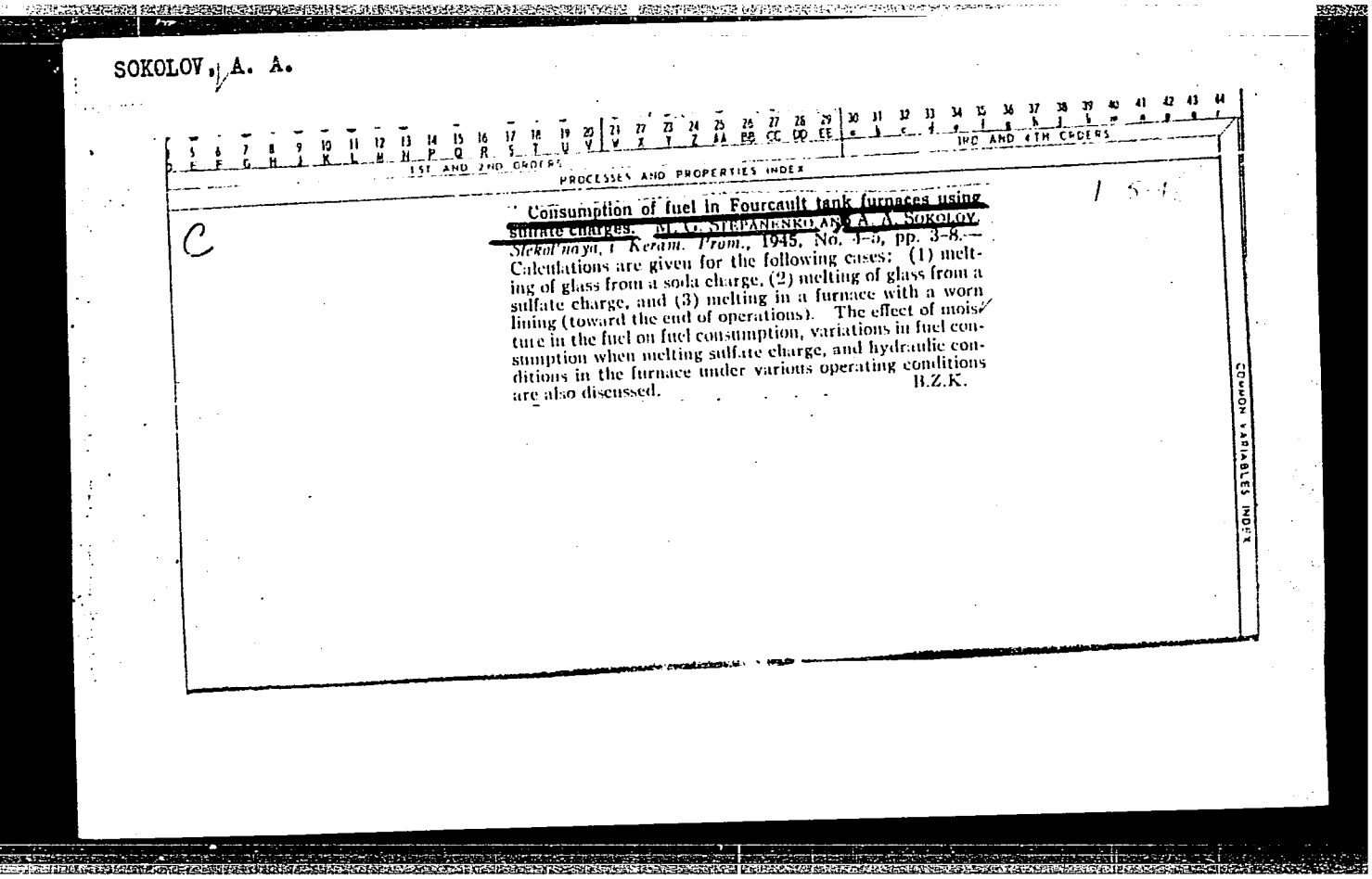
A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION



PROCESSES AND PROPERTIES INDEX

New use of soluble glass. A. A. SOKOLOV. *Steklo i Keram. Prom.*, 1945, No. 1-2, p. 11. Gives five examples of the successful use of soluble glass for binding refractories in glass furnaces. NOTE: The editors caution against generalizations, inasmuch as sufficiently reliable information is not available regarding the strength of the cemented refractories at high temperatures. B.Z.K.

A.S.T.M. METALLURGICAL LITERATURE CLASSIFICATION



SOKOLOV, A. A.

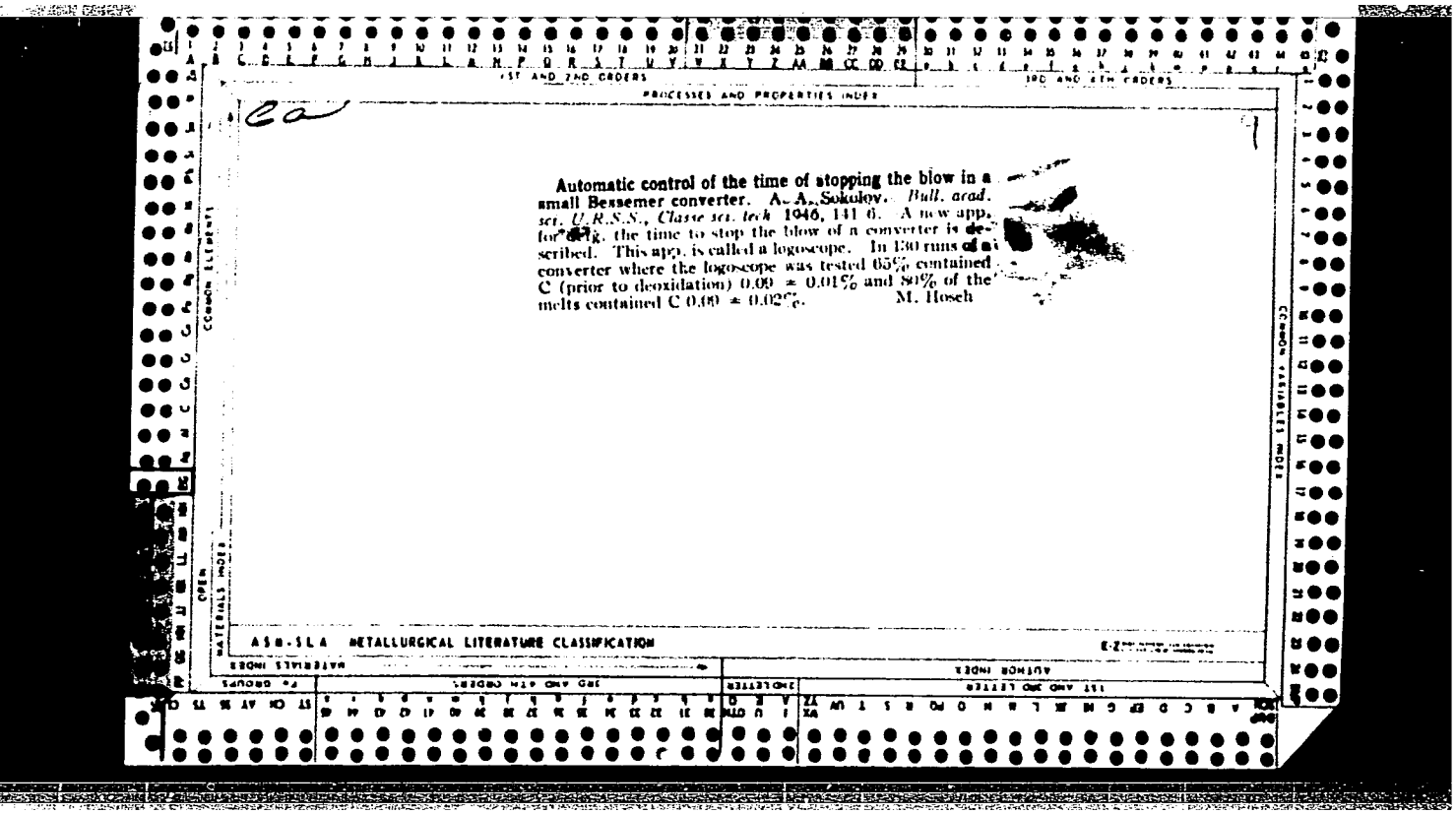
1ST AND 2ND ORDERS | PROCESSES AND PROPERTIES INDEX | 3RD AND 4TH ORDERS

C

1 5-4

Consumption of fuel in Fourcault tank furnaces using sulfate charges. M. V. STEPANENKO AND A. A. SOKOLOV. *Steklo i Keram. Prom.*, 1945, No. 4–5, pp. 3–8.—Calculations are given for the following cases: (1) melting of glass from a soda charge, (2) melting of glass from a sulfate charge, and (3) melting in a furnace with a worn lining (toward the end of operations). The effect of moisture in the fuel on fuel consumption, variations in fuel consumption when melting sulfate charge, and hydraulic conditions in the furnace under various operating conditions are also discussed. B.Z.K.

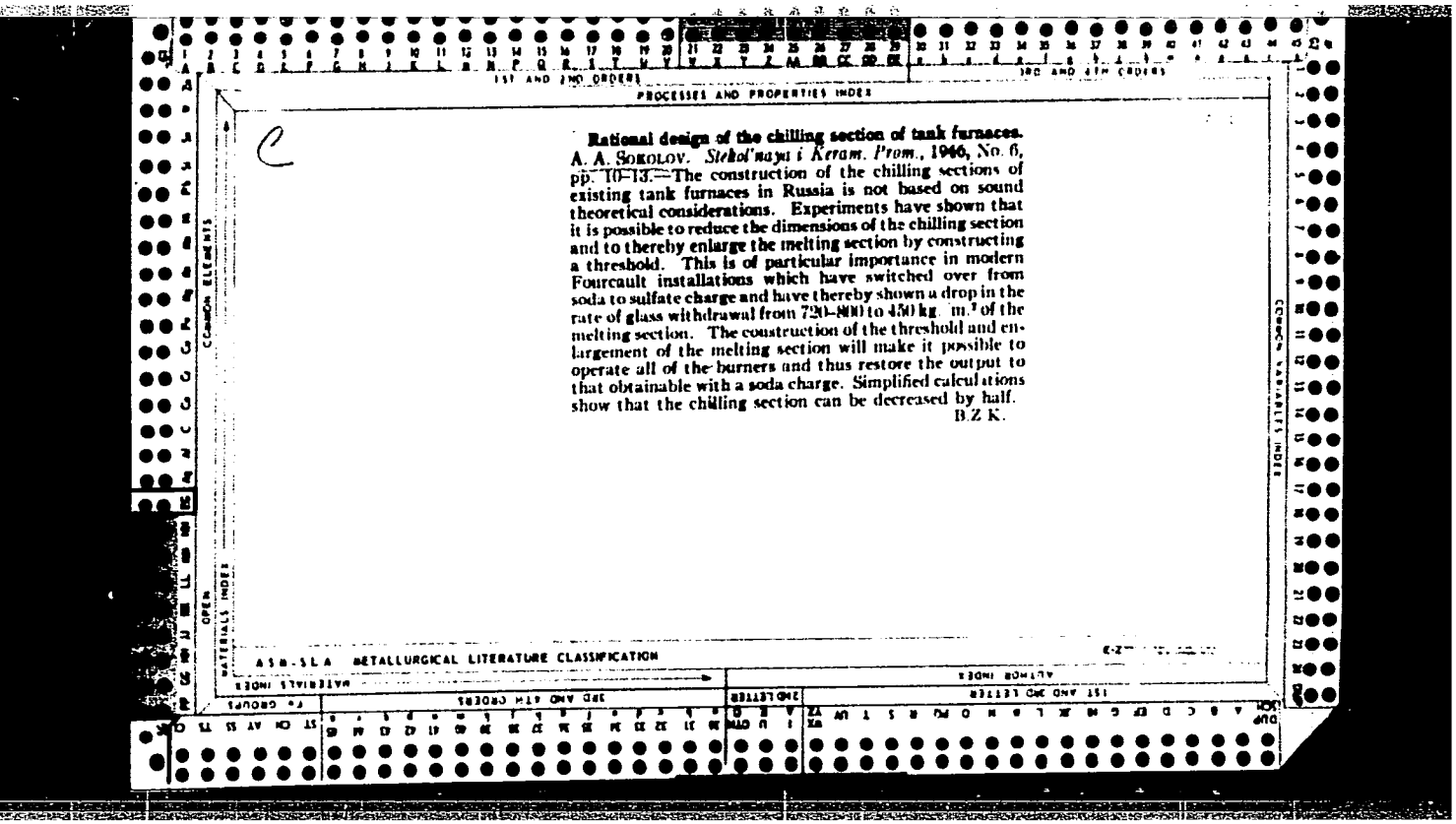
COMMON VARIABLES INDEX



PROCESSES AND PROPERTIES INDEX

Automatic control of the time of stopping the blow in a small Bessemer converter. A. A. Sokolov. *Bull. acad. sci. U.R.S.S., Classe sci. tech* 1946, 141 6. A new app. for det'g. the time to stop the blow of a converter is described. This app. is called a logoscope. In 130 runs of a converter where the logoscope was tested 65% contained C (prior to deoxidation) 0.09 ± 0.01% and 80% of the melts contained C 0.08 ± 0.02%. M. Hosch

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

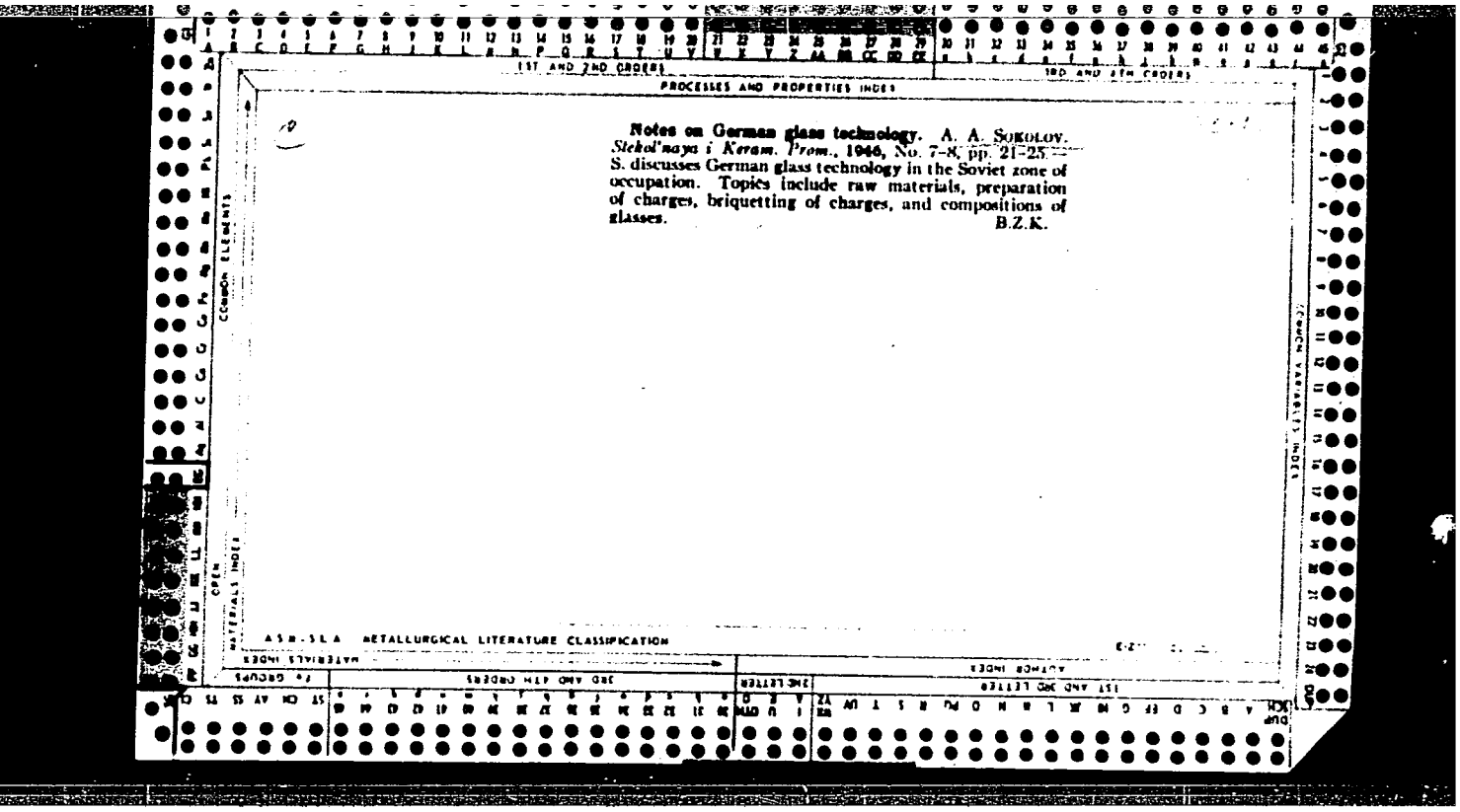


PROCESSES AND PROPERTIES INDEX

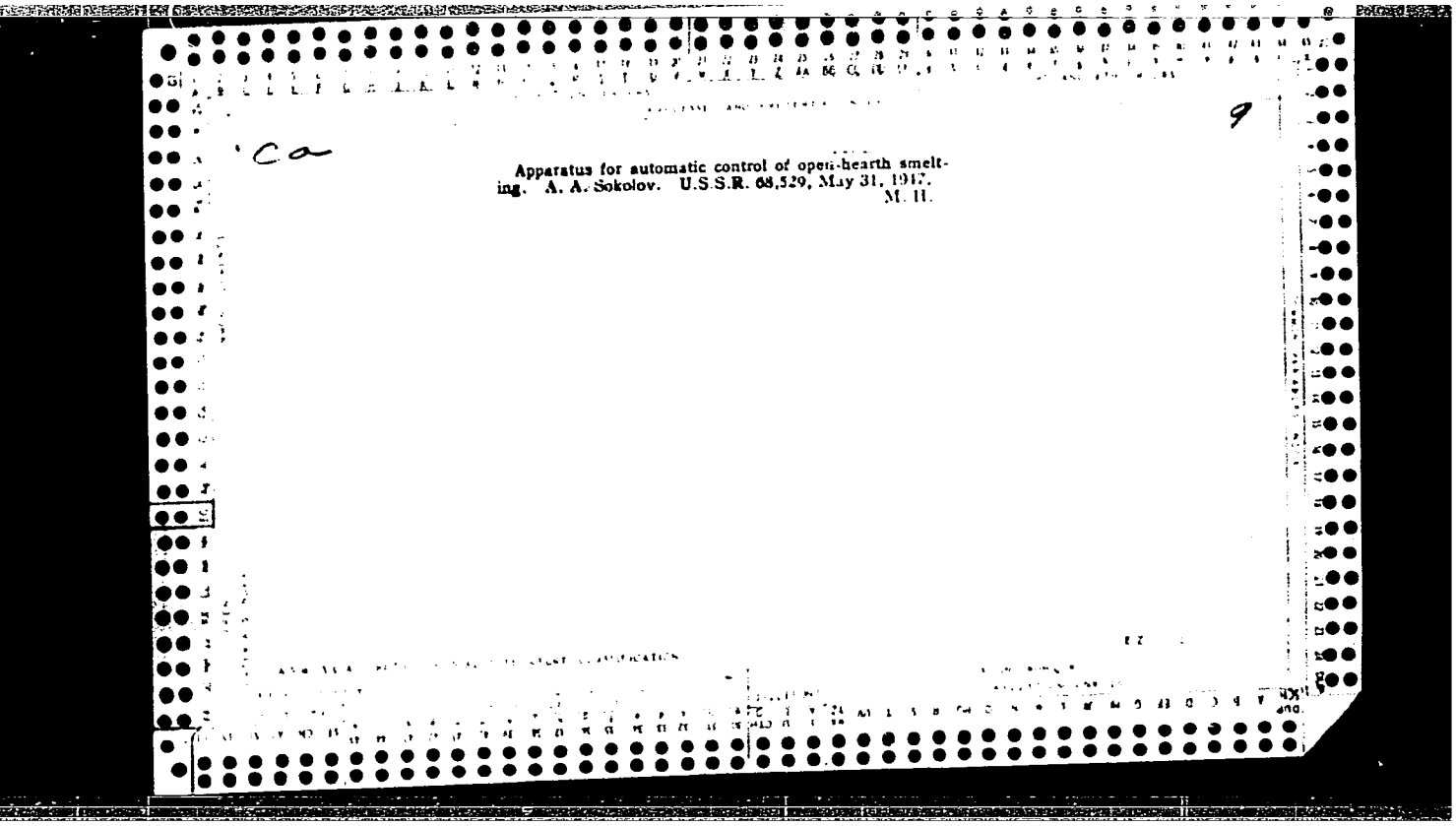
Rational design of the chilling section of tank furnaces. A. A. Sokolov. *Steklo'naya i Keram. Prom.*, 1946, No. 6, pp. 10–13.—The construction of the chilling sections of existing tank furnaces in Russia is not based on sound theoretical considerations. Experiments have shown that it is possible to reduce the dimensions of the chilling section and to thereby enlarge the melting section by constructing a threshold. This is of particular importance in modern Fourcault installations which have switched over from soda to sulfate charge and have thereby shown a drop in the rate of glass withdrawal from 720–800 to 450 kg. $m.^2$ of the melting section. The construction of the threshold and enlargement of the melting section will make it possible to operate all of the burners and thus restore the output to that obtainable with a soda charge. Simplified calculations show that the chilling section can be decreased by half.

B.Z.K.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION



Notes on German glass technology. A. A. SOKOLOV. *Stekol'naya i Keram. Prom.*, 1946, No. 7–8, pp. 21–25.—S. discusses German glass technology in the Soviet zone of occupation. Topics include raw materials, preparation of charges, briquetting of charges, and compositions of glasses.
B.Z.K.



Apparatus for automatic control of open-hearth smelting. A. A. Sokolov. U.S.S.R. 68,529, May 31, 1917. M. H.

SOKOLOV, A. A.

"Investigation of the Motion of Glass Mass in Tank Furnaces." Sub 22 May 47, Power Engineering Inst imeni G. M. Krzhizhanovskiy, Acad Sci USSR

Dissertations presented for degrees in science and engineering in Moscow in 1947.

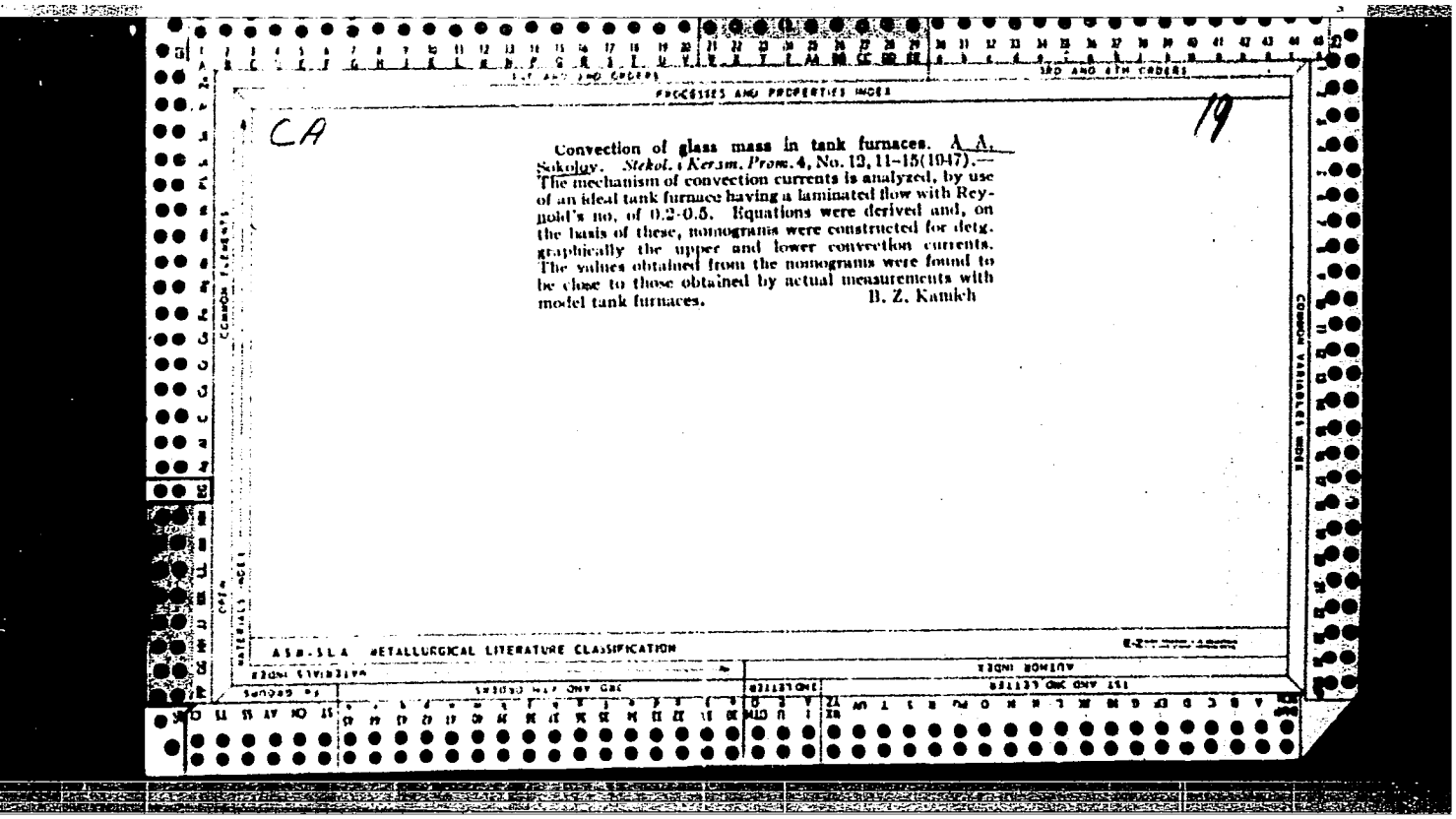
SO: Sum.No. 457, 18 Apr 55

SOKOLOV, A. A.

Notes on the German glass industry. A. A. Sokolov. *Stekol'naya i Keram. Prom.*, 1947, No. 1, pp. 10–23.—S. discusses the German glass industry in the Soviet zone of occupation from the standpoints of fuel, gas generators, and furnaces. Cf. *Ceram. Abstracts*, 1948, May, p. 98*h*.
B.Z.K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

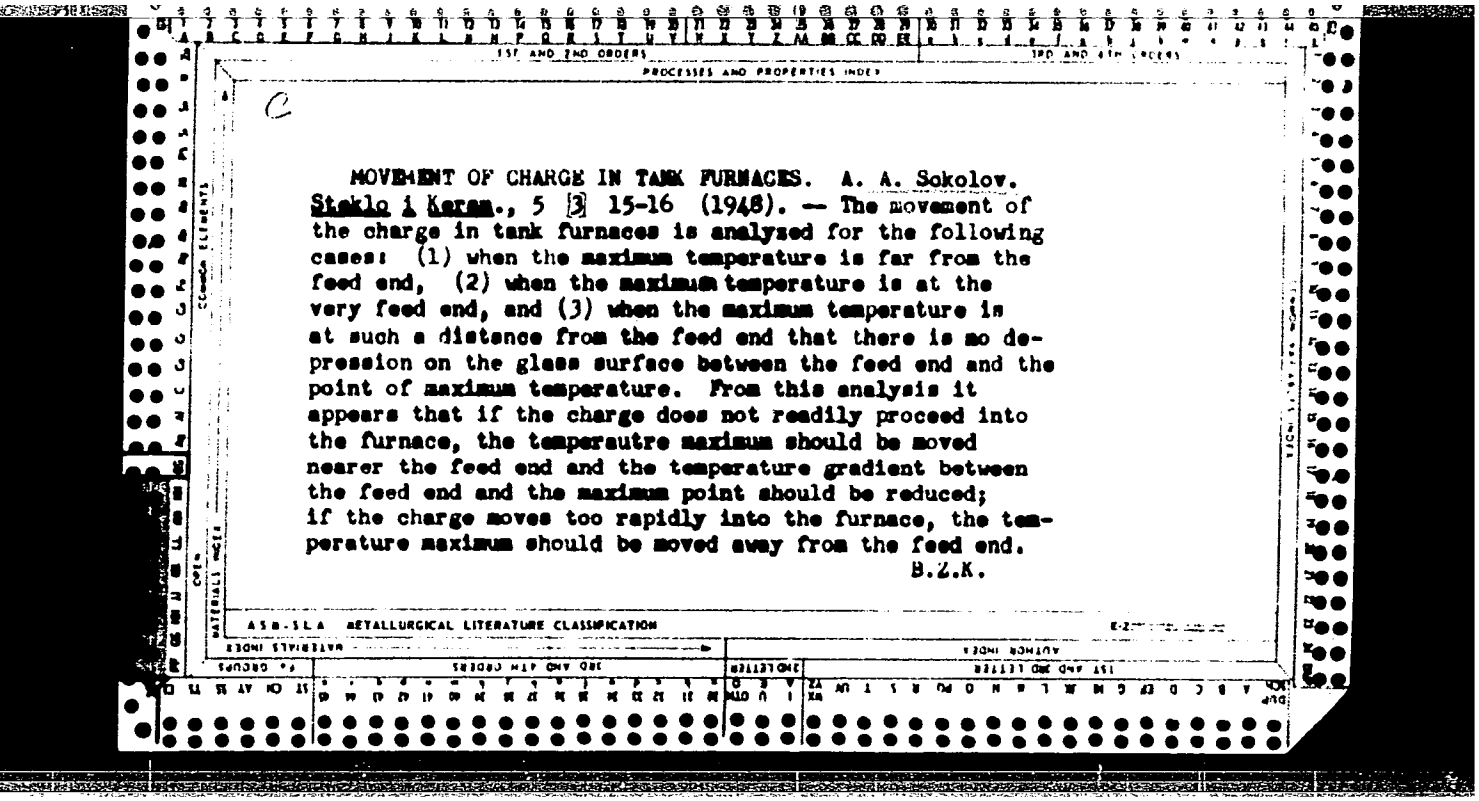
AUTHOR INDEX



CA

19

Convection of glass mass in tank furnaces. A. A. Sokolov. *Stekol. i Keram. Prom.* 4, No. 12, 11–15(1947).—The mechanism of convection currents is analyzed, by use of an ideal tank furnace having a laminated flow with Reynold's no. of 0.2–0.5. Equations were derived and, on the basis of these, nomograms were constructed for detg. graphically the upper and lower convection currents. The values obtained from the nomograms were found to be close to those obtained by actual measurements with model tank furnaces. B. Z. Kamich



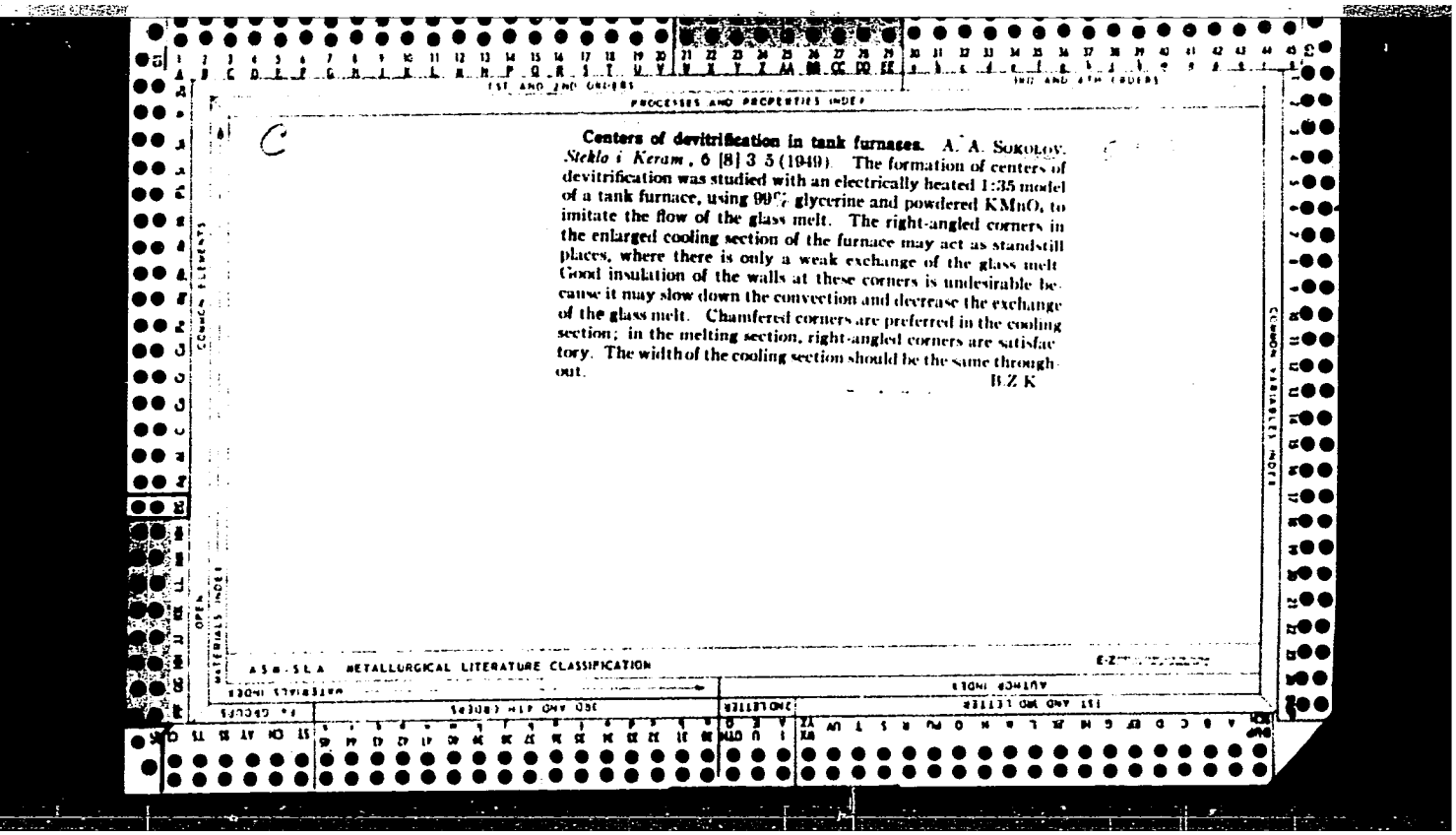
PROCESSES AND PROPERTIES INDEX

C

MOVEMENT OF CHARGE IN TANK FURNACES. A. A. Sokolov. Steklo i Keram., 5 [3] 15-16 (1948). — The movement of the charge in tank furnaces is analyzed for the following cases: (1) when the maximum temperature is far from the feed end, (2) when the maximum temperature is at the very feed end, and (3) when the maximum temperature is at such a distance from the feed end that there is no depression on the glass surface between the feed end and the point of maximum temperature. From this analysis it appears that if the charge does not readily proceed into the furnace, the temperautre maximum should be moved nearer the feed end and the temperature gradient between the feed end and the maximum point should be reduced; if the charge moves too rapidly into the furnace, the temperature maximum should be moved away from the feed end.

B.Z.K.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

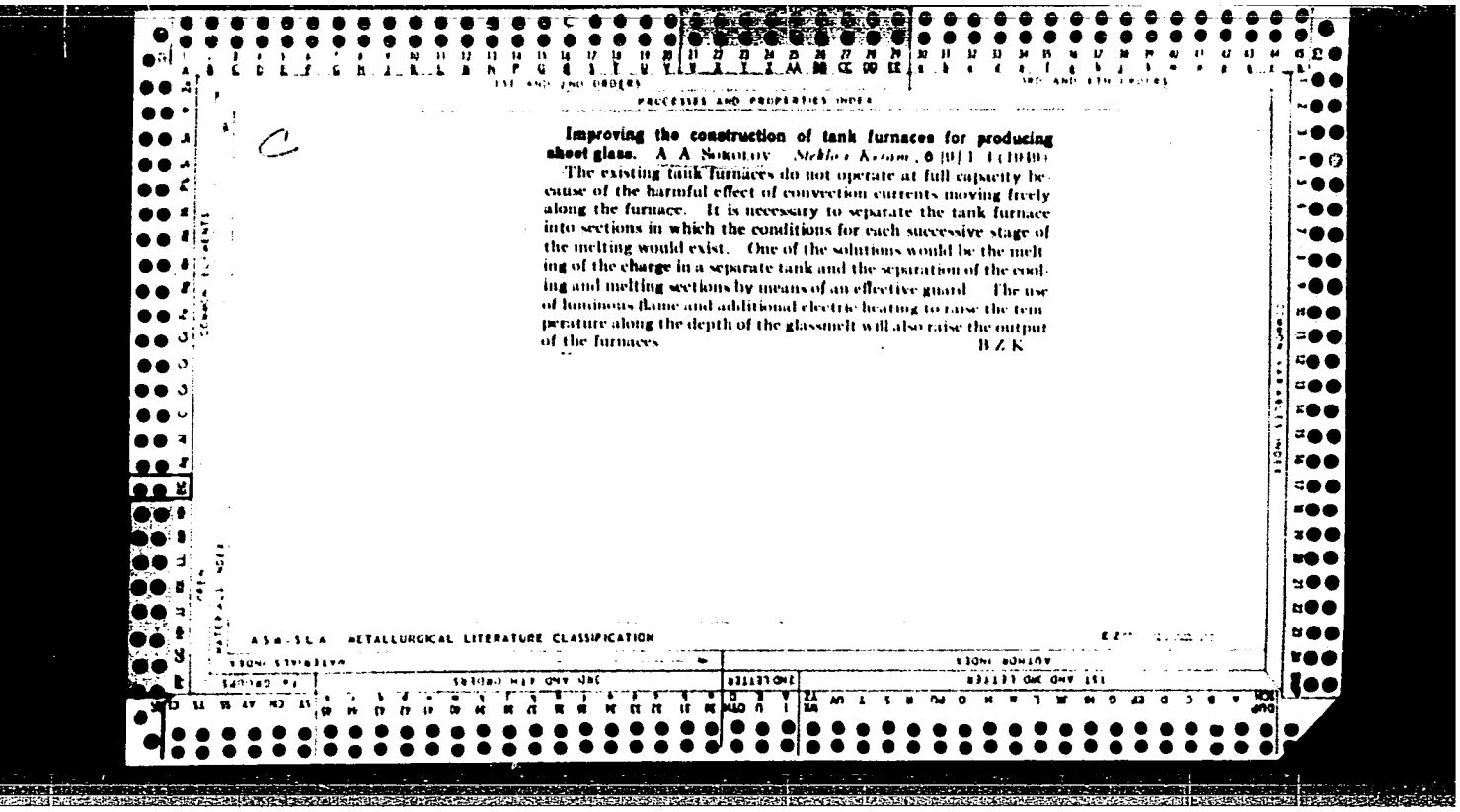


PROCESSES AND PROPERTIES INDEX

Centers of devitrification in tank furnaces. A. A. Sokolov. *Steklo i Keram*, 6 [8] 3-5 (1949). The formation of centers of devitrification was studied with an electrically heated 1:35 model of a tank furnace, using 99% glycerine and powdered $KMnO_4$ to imitate the flow of the glass melt. The right-angled corners in the enlarged cooling section of the furnace may act as standstill places, where there is only a weak exchange of the glass melt. Good insulation of the walls at these corners is undesirable because it may slow down the convection and decrease the exchange of the glass melt. Chamfered corners are preferred in the cooling section; in the melting section, right-angled corners are satisfactory. The width of the cooling section should be the same throughout.

B.Z.K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

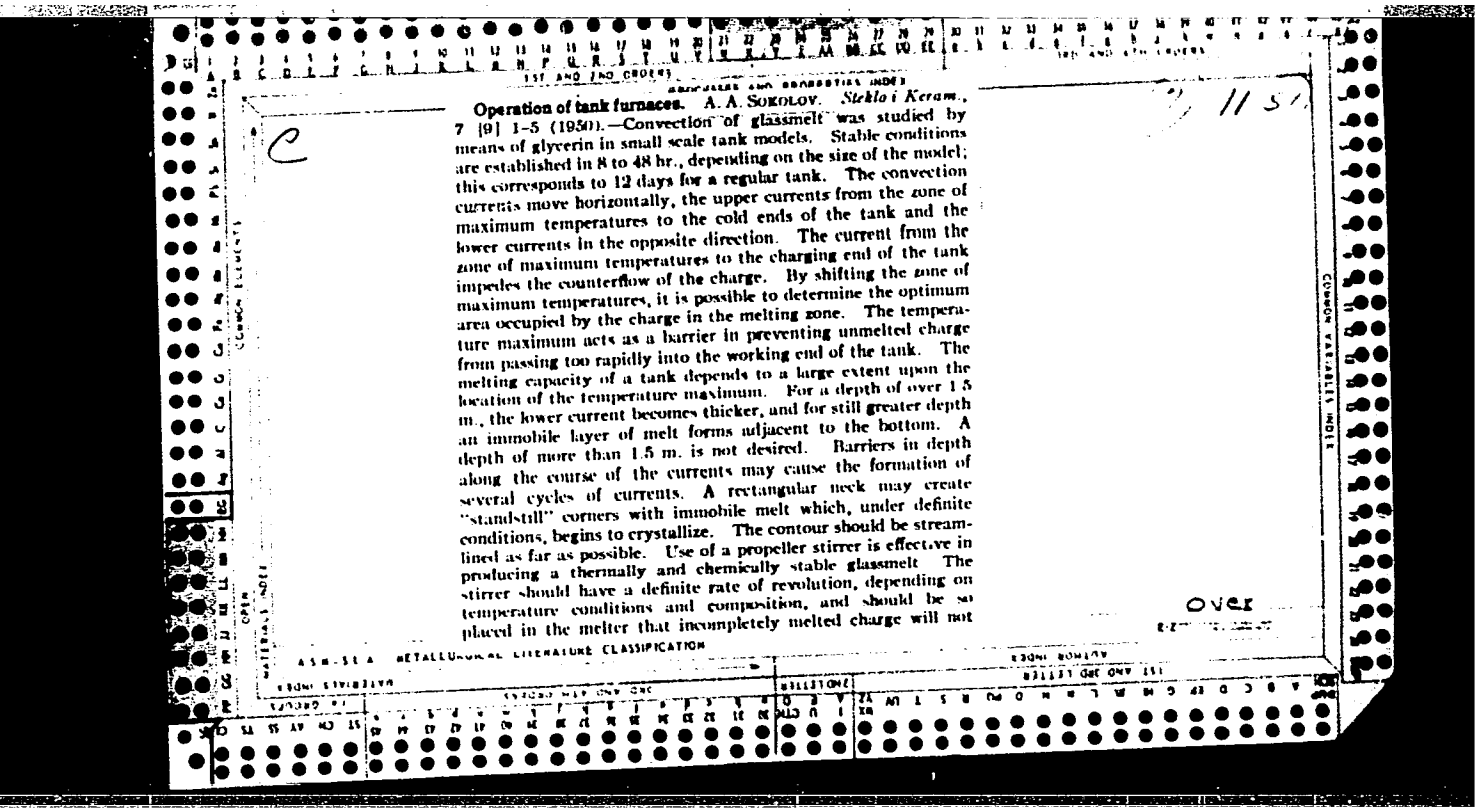


PROCESSES AND PROPERTIES INDEX

Improving the construction of tank furnaces for producing sheet glass. A A Sokolov *Steklo i Keram.*, 6 [8] 1 (1949)

The existing tank furnaces do not operate at full capacity because of the harmful effect of convection currents moving freely along the furnace. It is necessary to separate the tank furnace into sections in which the conditions for each successive stage of the melting would exist. One of the solutions would be the melting of the charge in a separate tank and the separation of the cooling and melting sections by means of an effective guard. The use of luminous flame and additional electric heating to raise the temperature along the depth of the glassmelt will also raise the output of the furnaces. B Z K

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



Operation of tank furnaces. A. A. SOKOLOV. *Steklo i Keram.*, 7 [9] 1–5 (1950).—Convection of glassmelt was studied by means of glycerin in small scale tank models. Stable conditions are established in 8 to 48 hr., depending on the size of the model; this corresponds to 12 days for a regular tank. The convection currents move horizontally, the upper currents from the zone of maximum temperatures to the cold ends of the tank and the lower currents in the opposite direction. The current from the zone of maximum temperatures to the charging end of the tank impedes the counterflow of the charge. By shifting the zone of maximum temperatures, it is possible to determine the optimum area occupied by the charge in the melting zone. The temperature maximum acts as a barrier in preventing unmelted charge from passing too rapidly into the working end of the tank. The melting capacity of a tank depends to a large extent upon the location of the temperature maximum. For a depth of over 1.5 m., the lower current becomes thicker, and for still greater depth an immobile layer of melt forms adjacent to the bottom. A depth of more than 1.5 m. is not desired. Barriers in depth along the course of the currents may cause the formation of several cycles of currents. A rectangular neck may create "standstill" corners with immobile melt which, under definite conditions, begins to crystallize. The contour should be streamlined as far as possible. Use of a propeller stirrer is effective in producing a thermally and chemically stable glassmelt. The stirrer should have a definite rate of revolution, depending on temperature conditions and composition, and should be so placed in the melter that incompletely melted charge will not

over

pass into the cooling section. To obtain thermally and chemically uniform glass for the machines, the melt should be fed directly from the tank to the machines. The use of obstruction boats between melting and refining zones is inadequate to impede strong convection currents. Photos, diagrams, and curves.

B.Z.K.

c

XI - Kilns, Furnaces
Fuels, • Combustion

Some results of the investigation of operating tanks. A A SOKOLOV. *Steklo i Keram.*, 7 [12] 11 19 (1950). The study included one tank of the old type and one with a canal for feeding the melt directly to the machines. Measurements included distribution of temperature in the tank, variation in temperature of the melt with time, heat currents in the gas medium of the tank, convection currents of the melt, and movement of the gas. Results are tabulated and graphed. Conclusions are as follows: (1) The zone for melting the charge should be separated from the remaining section of the tank with an effective barrier which will completely retard the movement of the convection currents. (2) A cooling section of small dimensions is necessary to cool one working stream of melt without its usually accompanying convection currents. (3) The whole tank could be reduced several fold, in comparison with existing furnaces, without reducing the capacity of the furnace. A furnace of this type was constructed at the Lisichansk glassworks, and operating results will be published soon. B Z K

SOKOLOV, A. A.

SOKOLOV, A. A. -- "INVESTIGATION OF CONVECTION CURRENTS OF A GLASS MASS IN BATH FURNACES."
Sub 27 Nov 52, POWER ENGINEERING INST IMENI G. M. KRZHIZHANOVSKIY, ACAD SCI USSR
(DISSERTATION FOR THE DEGREE OF DOCTOR IN TECHNICAL SCIENCES)

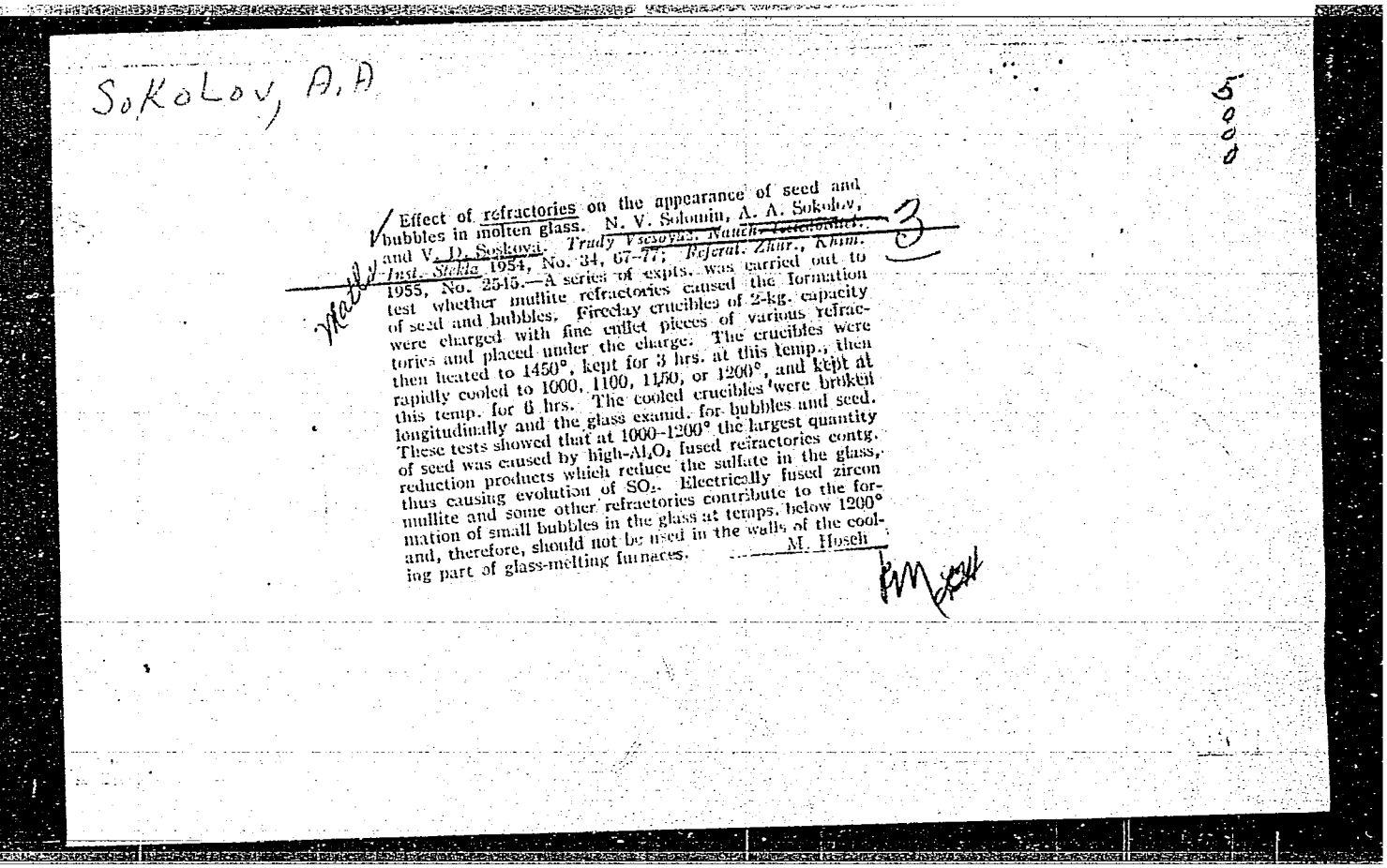
SO: VECHERNAYA MOSKVA, JANUARY-DECEMBER 1952

1. SOKOLOV, A.A.
2. USSR (600)
4. Furnaces
7. Operation of tank furnaces in glassmaking, Stek. i ker. 10 no. 4, 1953.

9. Monthly List of Russian Accessions, Library of Congress, APRIL 1953, Uncl.

SHUMILOVSKIY, N.N.(Moskva); SOKOLOV, A.A.(Moskva).

Infrared methods used for gas analysis. Avtom. i telem. 14 no.3:328-335 My-Je '53. (MLRA 10:3)
(Gases--Analysis) (Infrared rays)



SoKoLov, A.A

5000

Effect of refractories on the appearance of seed and bubbles in molten glass. N. V. Solomin, A. A. Sokolov, and V. D. Soskova. *Trudy Vsesoyuz. Nauch.-Issledovatel. Inst. Stekla* 1954, No. 34, 67–77; *Referat. Zhur., Khim.* 1955, No. 2545.—A series of expts. was carried out to test whether mullite refractories caused the formation of seed and bubbles. Fireclay crucibles of 2-kg. capacity were charged with fine cullet pieces of various refractories and placed under the charge. The crucibles were then heated to 1450°, kept for 3 hrs. at this temp., then rapidly cooled to 1000, 1100, 1150, or 1200°, and kept at this temp. for 6 hrs. The cooled crucibles were broken longitudinally and the glass exaud. for bubbles and seed. These tests showed that at 1000–1200° the largest quantity of seed was caused by high-Al_2O_3 fused refractories contg. reduction products which reduce the sulfate in the glass, thus causing evolution of SO_2. Electrically fused zircon mullite and some other refractories contribute to the formation of small bubbles in the glass at temps. below 1200° and, therefore, should not be used in the walls of the cooling part of glass-melting furnaces.

M. Hosch

SOKOLOV, A.A.

USSR/ Engineering - Glass furnaces

Card 1/1 Pub. 104 - 3/11

Authors : Sokolov, A. A., Dr. of Tech. Sc.

Title : Wall cooling of a bath-type glass-furnace basin

Periodical : Stek. i ker. 2, 5 - 13, Feb 1955

Abstract : The purpose of artificial cooling of glass-furnace basin-walls is explained. It is pointed out that wall cooling is effective only when the internal surfaces of the bricks facing the glass mass have a lower temperature and a viscous layer is formed which is not carried away by the convection flows of the glass mass. It is recommended that the construction of a rational cooling system should always be based on the calculation of the convection flows of the glass mass and heat exchange. A method of installing wall coolers is described. Four USSR references: (1936 - 1952). Tables; diagrams; drawings; graphs.

Institution: .....

Submitted: .....

SOKOLOV, A.A

15

Glass-melting furnace. A. A. Sokolov, V. A. Baum, A. N. Orlov, and I. I. Kuksin. U.S.S.R. 104,609, Jan. 25, 1957. The furnace comprises a melting basin, a settling basin, and a gathering basin. The bottom of the melting basin is so built that the burners are tangential to it. M. Hoseh

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SOKOLOV, A. A.

"Study of the Heat Convection of Molten Glass in Tank Furnaces with Computation Based on a Model." p. 3

"Use of the Electrothermal Analogy Method to Demonstrate the Transfer of Heat Through the Tank Wall of a Furnace for Melting Glass." p. 17

Teplovyye protsessy v promyshlennosti (Thermal Processes in Industry) Moscow, 1958 145p. (Series: Moscow, Institut khimicheskoye mashinostroyeniya, Trudy, t. 16, No. 2)

The book contains 11 articles which give the results of research on heat convection, combustion dynamics, fuel economy, and the mechanization of heating processes.

SOKOLOV, A.A., prof., doktor tekhn.nauk

Unit-Melter glass furnace. Stek.i ker. 17 no.4:41-42 Ap '60. (MIRA 13:8)
(India--Glass furnaces)

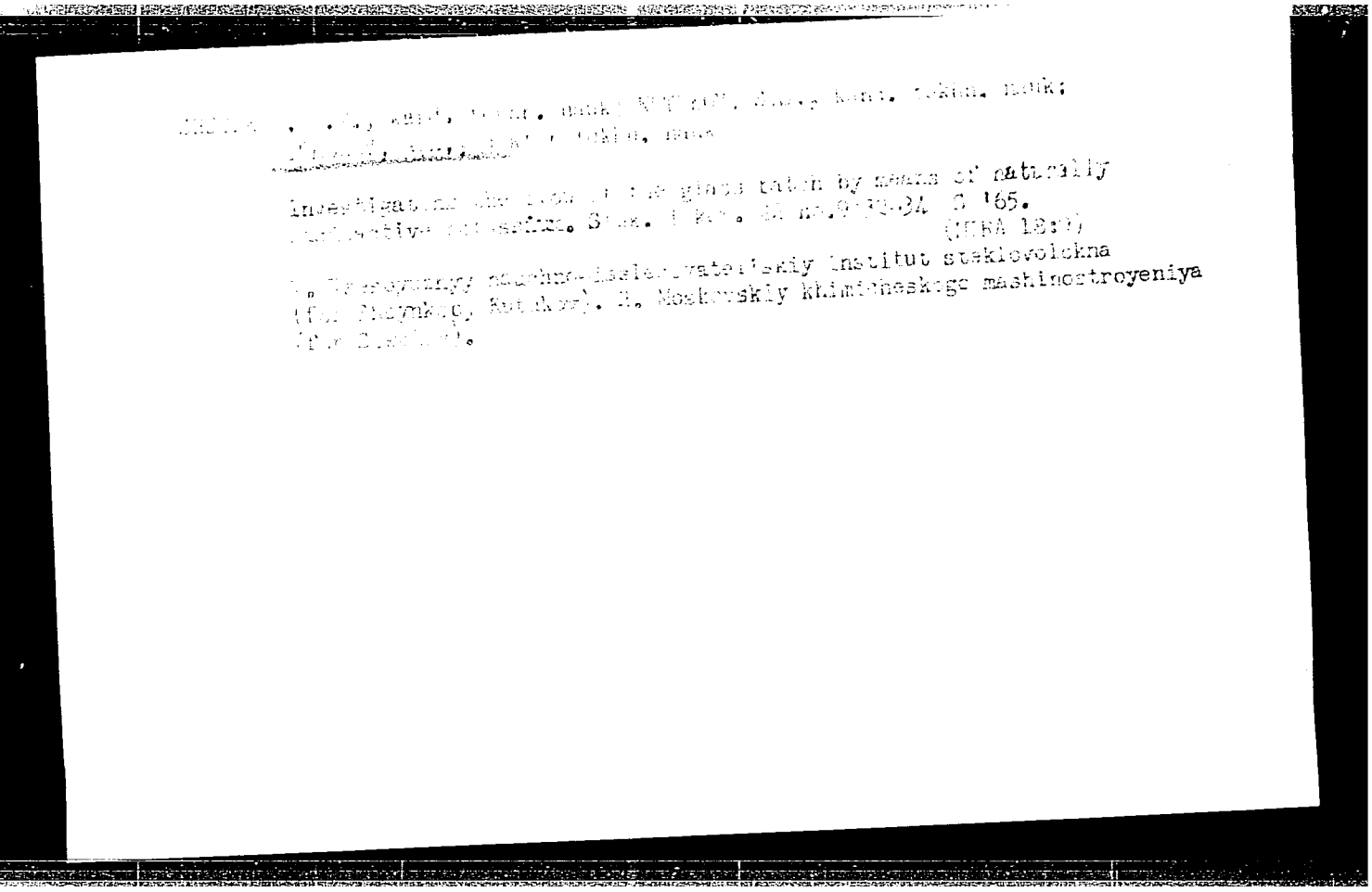
SOKOLOV, A.A., doktor tekhn.nauk, prof.

Calculations for the basic convection flow of melted glass in pot furnaces. Stek.i ker. 19 no.4:7-10 Ap '62. (MIRA 15:8)
(Glass furnaces)

PCHELYAKOV, K.A., inzh.; SOKOLOV, A.A., doktor tekhn. nauk

Calculating the flow parameters of the glass batch in the melting end, the feeder or the working end of a tank furnace. Stek. i ker. 22 no.7:1-4 Jl '65. (MIRA 18:9)

1. Gusevskoy filial Gosudarstvennogo instituta stekla (for Pchelyakov).
2. Moskovskiy institut khimicheskogo mashinostroyeniya (for Sokolov).



KRASIL'NIKOV, N.A.; DUDA, V.I.; SOKOLOV, A.A.

New types of sporulation in anaerobic bacteria. Dokl. AN SSSR 159 no.2:434-435 N '64. (MIRA 17:12)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova.
2. Chlen-korrespondent AN SSSR (for Krasil'nikov).

KRASIL'NIKOV, N.A.; DUDA, V.I.; SOKOLOV, A.A.

Protrusions on the surface of spores of anaerobic bacteria of the genus Clostridium. Mikrobiologiia 33 no.3:454-458 My-Je '64. (MIRA 18:12)

1. Biologo-pochvennyy fakul'tet Moskovskogo gosudarstvennogo universiteta imeni M.V.Lomonosova.

KRASIL'NIKOV, N.A.; DUDA, V.I.; SOKOLOV, A.A.

External outgrowths in the spores of anaerobic bacteria of the genus Clostridium. Dokl. AN SSSR 152 no.3:735-736 S '63. (MIRA 16:12)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova.
2. Chlen-korrespondent AN SSSR (for Krasil'nikov).

PETMINA, A. M., SOKOLOV, A. A.

Soils - Caspian Depression

Soils of the Caspian Lowland. Pochvovadenie. No. 1, 1952.

9. Monthly List of Russian Accessions, Library of Congress, June 1952 1953, Uncl.

SOKOLOV, A. A.

"Role of the Earthworm in the Formation of Soils in the Northwestern Altay Region." Cand Agr Sci, Inst of Soil Sciences, Acad Sci Kazakh SSR, Alma-Ata, 1953. (RZhBiol, No 8, Dec 54)

Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (12)
SO: Sum. No. 556, 24 Jun 55

SOKOLOV, A. A.

"Application of Different Forms of Fertilizers to the Main Soil Types of the USSR," a paper presented at the 6th International Soil Science Congress, Paris, 28 Aug to 8 Sep 56.

In Library Branch #5

USSR/Soil Science. Tillage. Land Reclamation. Erosion. J-5

Abs Jour: Ref Zhur-Biol., No 6, 1958, 24825.

Author : Uspanov, U.U.; Sokolov, A.A.; Vladimirov, N.M.
Inst :
Title : The Soil-Reclamation Character of Lands of the Northern Precaspia.

Orig Pub: Tr. In-ta pochvoved. AN KazSSR, 1956, 4, 231-241.

Abstract: The character of the lands is listed from the standpoint of their fitness for irrigated agriculture. In the Volga-Urals interriver territory, southward of 49° N. lat., the authors discern the following soil-reclamation groups of lands. 1. Lands suitable for irrigated agriculture with the observance of measures against secondary salinity (light-chestnut and brown solonetz soils). 2. Soils suitable for

Card : 1/3

SOKOLOV, A.A.; FAIZOV, K.Sh.

Soils of pine strip forests along the Irtysh River in Pavlodar Province. Izv.AN Kazakh.SSR.Ser.bot.i pochv. no.2:3-15 '59. (MIRA 13:5)
(Irtysh Valley--Forest soils)

PACHIKINA, Lyubov' Ivanovna; RUBINSHTEYN, Mikhail Issakovich; STOROZHENKO, D.M., otv.red.vypuska; BEZSONOV, A.I., otv.red.; BOROVSKIY, V.M., red.; SOKOLOV, A.A., red.; SOKOLOV, S.I., red.; USPANOV, U.U., red.; POGOZHEV, A.S., red.; ROROKINA, Z.P., tekhn.red.

[Soils of Kazakhstan in 16 volumes] Pochvy Kazakhskoi SSR v 16 vypuskakh. Alma-Ata. Vol.2. [Soils of Kokchetav Province] Pochvy Kokchetavskoi oblasti. 1960. 135 p. (MIRA 13:8)

1. Akademiya nauk Kazakhskoy SSR, Alma-Ata. Institut pochvovedeniya.
(Kokchetav Province--Soils)

DZHANPEISOV, R.; SOKOLOV, A.A.; FAIZOV, K.Sh.; BEZSONOV, A.I., glavnyy red.; USPANOV, U.U., zam.glavnogo red.; BOROVSKIY, V.M., red.; SOKOLOV, S.I., red.; STOROZHENKO, D.M., red.; BARLYBAYEVA, K.Kh., red.; IVANOVA, E.I., red.; PROKHOROV, V.P., tekhn.red.

[Soils of the Kazakh S.S.R. in 16 volumes] Pochvy Kazakhskoi SSR v 16 vypuskakh. Alma-Ata. Vol.3. [Soils of Pavlodar Province] Pochvy Pavlodarskoi oblasti. 1960. 264 p.
(MIRA 13:11)

1. Akademiya nauk Kazakhskoy SSR, Alma-Ata. Institut pochvovedeniya.
(Pavlodar Province--Soils)

SOKOLOV, A.A.; DZHANPEISOV, R.; FAIZOV, K.Sh.

Classification of Chestnut soils of the Irtysh Valley. Izv.AN Kazakh.SSR.Ser.bot.i pochv. no.2:36-45 '50. (MIRA 13:8)
(Pavlodar Province--Soils--Classification)

SOKOLOV, A.A.; DZHANPEISOV, R.; KOTIN, N.I.

Subaerial meadow-steppe Solonetz complexes in the middle Irtysh Vally. Pochvovedenie no.7:32-42 '60. (MIRA 13:7)

1. Institut pochvovedeniya Akademii nauk KazSSR.
(Pavlodar Province--Solonetz soils)
(Semipalatinsk Province--Solonetz soils)

SOKOLOV, A.A.; KOTIN, N.I.

Lithogenous soil complexes of the southeastern part of the Kazakh undulating plain. Pochvovedenie no.10:1-7 '60. (MIRA 13:10)

1. Institut pochvovedeniya Akademii nauk KazSSR.
(Kazakhstan--Soils)

S/058/63/000/001/033/120
A062/A101

AUTHOR: Sokolov, A. A.

TITLE: Problem of the non-conservation of parity

PERIODICAL: Referativnyy zhurnal, Fizika, no. 1, 1963, 3, abstract 1B26 (In collection: "Elektron. uskoriteli". Tomsk, Tomskiy un-t, 1961, 393 - 399)

TEXT: Non-conservation of parity in processes with neutrino participation is analyzed on the basis of the 4-component Dirac equation describing longitudinally polarized fermions. The fermion hirality is described by the explicit introduction of eigenvalues ($s = \pm 1$) of the projecting operator $\sigma p/p$ in the wave function; thus the non-conservation of parity is directly related to the spin properties of the particles. It is emphasized that the 4-component oriented spin neutrino theory also admits one of the possible solutions of the form TV = const, I = const, which does not contradict the Luders-Pauli theorem.

B. Kerimov

[Abstracter's note: Complete translation]

Card 1/1

SOKOLOV, A.A.; KOLKHODZHAYEV, M.K.; KOTIN, N.I.

Natural zones, belts, and regions in Semipalatinsk Province. Izv. AN Kazakh.SSR. Ser. bot. i pochv. no.2:16-29 '61. (MIRA 15:2)
(Semipalatinsk Province--Land)

SOKOLOV, A.A.; KOTIN, N.I.

Soloth soils and solodization of the arid steppe and desert-steppe zone of the Semipalatinsk portion of the Irtysh Valley. Pochvovedenie no. 5:43-53 My '61. (MIRA 14:5)

1. Institut pochvovedeniya AN KazSSR.
(Semipalatinsk Province—Soloth soils)

SOKOLOV, S.I.; ASSING, I.A.; KURMANGALIYEV, A.B.; SERPIKOV, S.K.; BEZSONOV, A.I., glav. red.; BOROVSKIY, V.M., red.; SOKOLOV, A.A., red.; STOROZHENKO, D.M., red.; USPANOV, U.U., red.; SHEVCHUK, T.I., red.; ROROKINA, Z.P., tekhn. red.

[Soils of the Kazakh S.S.R. in 16 volumes] Pochvy Kazakhskoi SSR v 16 v puskakh. Alma-Ata, Izd-vo Akad. nauk Kazakhskoi SSR. Vol.4. [Alma-Ata Province] Pochvy Alma-Atinskoi oblasti. 1962. 422 p. (MIRA 15:4)

1. Akademiya nauk Kazakhskoy SSR, Alma-Ata. Institut pochvovedeniya.

(Alma-Ata Province--Soils)

SOKOLOV, A.A.; KOTIN, N.I.

Shallow light chestnut soils forming on the binary sediments of mud-volcanic valleys in the southeastern part of the Kazakh peneplain. Izv. AN Kazakh. SSR. Ser. biol. nauk no.2:25-31 '63. (MIRA 17:10)